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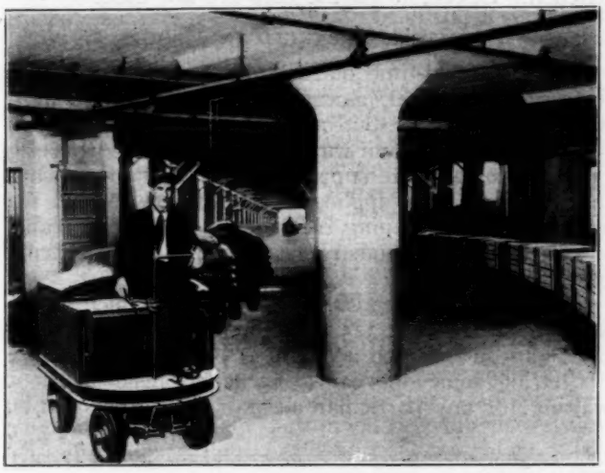
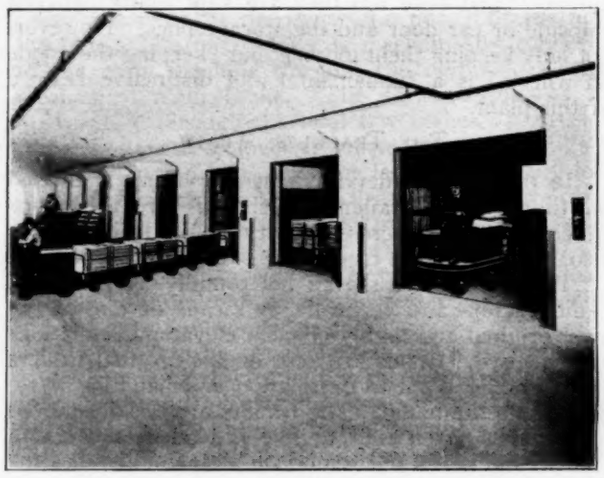


View of Runway and "Trackless Trains" in Operation at the Brooklyn Army Base.



View of Group of Ten "Operatorless" Elevators Which Are Controlled by Electricity at Central Point.

Electrical Features of the Brooklyn Army Supply Base

Utilization of Electric Tractors and of Group-Controlled Operatorless Elevators Form Important Links in Operation of World's Greatest Terminal and Distributing Warehouse

RISING in impressive magnitude on the waterfront of New York bay, constructed under the stress and secrecy of war, is the world's greatest single terminal and distributing warehouse plant. It is known as the U. S. army supply base, Brooklyn, and is the largest of the great receiving and distributing bases erected by the government.

These bases claim our attention as timely examples of what and must be done at our great coastal, lake and river ports and rail centers if not only the opportunities but the actual and urgent requirements of the very near future are to be all adequately met, and our new-born merchant marine properly supported.

Not only in size do they dwarf kindred commercial developments of the past, but in them have been incorporated the practical working out of so many of the latest and best ideas of architects, engineers, warehousemen and material-handling machinery manufacturers that they demand the closest scrutiny and consideration of those concerned with provisions for meeting commercial developments which the competent and keen visioned tell us are soon bound to far exceed anything in our previous experience.

The Brooklyn army base embraces about 100 acres from landward line to pierhead, over 15 miles of railroad tracks, which include storage for 1300 freight cars and 8000 ft. of available string-piece intended for loading simultaneously a dozen deep-draught ocean freight carriers.

There are two main warehouse buildings, "A," 200 ft. by 980 ft., and "B," 240 ft. by 980 ft., a mechanical and repair building, a four-story administration building, and three "transfer sheds" or pier houses, 150 ft. by 1350 ft. each, which function in the transfer of freight to and from the water carriers.

The warehouse floors contain over 4,000,000 ft. of floor space and the transfer sheds 1,250,000 ft., or a combined total of 116 acres. Including the transfer sheds for transient use, this affords actual storage space for about 15,000 carloads of goods.

Handling 15,000 carloads, or 300,000 to 400,000 tons of freight, on a 30-day turnover basis, particularly in these times of labor shortage, requires the utmost possible conservation of time and effort. The whole handling system of the Brooklyn plant is calculated to meet those big problems in freight and merchandise handling which begin and end at the shipside or car door and involve loading, unloading, plant movement, both horizontally and vertically, and tiering.

In addition to the size of the plant there are several outstanding features which mark a great advance in merchandise and freight-handling equipment as well

as in methods employed, and the progress in the art of vertical transportation as applied thereto.

The utmost practical utilization is made of various devices for the reduction of manual handling. There are automatic elevators, cranes and derricks, lifting trucks for picking up whole loads with one single operation and shifting to other locations, trailer trucks and both gravity roller and portable power conveyors.

It is an old warehouse maxim to "keep the goods moving," and here too they are kept going between shipside or car door and the storage piles. However, not only keeping them moving, but "keeping the goods on wheels" is a fundamental and distinctive feature of this plant.

The Trackless Train.

In this modern development everything is carried on four-wheeled trailer trucks, and here the goods which are carried across country by the trainload are also handled by the truck trains through the plant.

The trailers are moved horizontally by industrial plant tractors and vertically by means of one of the most original and highly efficient elevator installations ever devised. Goods are kept on the original trailers from loading point to destination and handling is reduced to a minimum. The trailers are usually moved in trains of from four to five if loaded, and six to eight if light, and one man with a tractor handles the train. This should be contrasted with the string of handlers which would be necessary to move an equal tonnage with the old two-wheeled "baggage" trucks.

The tractors and trailer trucks are, of course, narrow gauge, and the trains are easily handled in the aisles and around the turns. For short trailer movements tractors are not used, as one man readily handles on a four-wheeled truck two or three times the average load of a two-wheeled hand truck.

The whole plant is laid out in definite one-way traffic lanes, carefully calculated to afford maximum access and minimum congestion.

In addition to the yard movement, this traffic system includes communication between the transfer sheds and warehouse "A" via three bridges which connect the second pier level with the third warehouse level, while additional bridges and subways under streets connect warehouses "A" and "B." This practically eliminates the necessity for tractors and trailers to cross the railroad tracks in the yard or streets, as the goods moving between the first pier shed level and the warehouse floors travel via the pier elevators, the bridges, subways and the warehouse elevators.

Ninety Operatorless Elevators.

Speeding up and controlling the horizontal movement on one level, however, is not the most serious problem confronting most plant and warehouse managers. Comparatively few executives conceive the extent to which indifferent elevator service affects plant turnover, but as a matter of fact as the number of levels or stories increases the elevators become more and more as the spout of the funnel and their efficiency the measure of the rate of the flow of goods.

This fact was given a great deal of consideration in planning the Brooklyn army base, with the result that an elevator plant with many original and ingenious features was devised.

There are in all 96 elevators, of which 90 are for freight and six for passenger service.

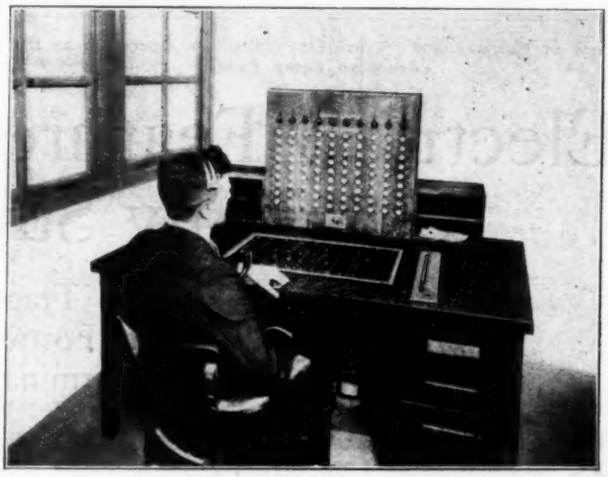
The 90 freight elevators are of 10,000 lbs. capacity; 18 are located in the pier sheds, serve two floors, and have a speed of 100 ft. per min. Seventy-two are located in the warehouses, serve nine floors, and have a speed of 150 ft. per min.

Each elevator platform is 9 ft. 4 in. by 17 ft. in the clear and intended to carry four trucks. Automatic stops are accomplished wherein the elevator platforms register accurately with the landing sills by means of automatic levelling devices, and the landing or hoistway doors are opened automatically when the elevator reaches the floor to which it has been dispatched. Operators on the cars are not used.

Elevators Arranged in Groups.

In a few old-time office buildings and hotels one finds the passenger elevators scattered about individually or in pairs, but modern practice groups them to secure the minimum waiting time between departing cars and to facilitate supervision. This same reasoning unquestionably applies to freight service, and the advantages of grouping elevators in industrial plants is conclusively demonstrated in the Brooklyn army base.

From seven to ten cars make a group which serves a "section," or some 325 ft. in length, of each building unit, and out of such a group one is reasonably sure of getting some one car to serve his needs without waiting for any particular elevator. In other words,



Dispatcher's Desk for "Operatorless" Elevator System. This One Man Operates Ten Elevators, Each Covering Eight Floors and Basement.

with ten cars in a group, the average waiting time will obviously be just one-tenth of what it would be if each car was placed separately.

Central Dispatch Control.

In the Brooklyn army base each group of elevators is handled entirely by a central dispatcher, who is located in a small office placed for convenience a short distance from the group. Before him is a table not unlike a telephone switchboard, with one upright and one horizontal panel. In the upright panel is a column of white lights for each elevator, each light representing a floor. At the top of each column is a colored light which indicates, when lighted, that all hatchway doors are closed and the elevator can be operated. The operating buttons are placed in rows in the horizontal panel.

The group system, in which the elevators are operated by a central dispatcher instead of each elevator being placed separately and operated individually, gives the least waiting time and maximum service out

of a given number of elevators. A central dispatcher with a group of elevators under his control and knowing all the requirements can get better service than can be obtained from the same or even a greater number of elevators placed singly and subject to both the varying intelligences and the loading tendencies of as many individual operators.

In general or miscellaneous service, which is the most difficult to handle, the dispatcher receives calls for cars from the various floors. As an example, the dispatcher gets a call for a car from the seventh floor to take goods to the third floor. A quick glance at the vertical panel shows that car No. 5 is standing idle at the sixth floor, since its "6" white light is burning. The colored lamp at the top of the row is lighted, indicating that all doors are closed. The central dispatcher then touches "7" button and the white light disappears as the car leaves the sixth floor, and shortly signals arrival at the seventh floor by means of a light in bulb "7." As the doors open automatically the colored light is extinguished and the car is out of the control of the dispatcher and cannot be run until some one on the seventh floor touches one of the seventh floor "door closing" buttons, of which one is on either end of the car and two others alongside the opposite entrances. As soon as the load has been run on and the door button pushed the doors close and the colored light again appears, signaling to the dispatcher that all is clear to go ahead. He then touches "3" button, thereby dispatching the car to the third or destination floor.

When certain elevators have been assigned by the dispatcher to regular or fixed service for a time, such as handling a trainload of flour going from the first level to the seventh, individual calls are not needed, for the lights alone tell the story, the appearance of both a colored and a white light in the same panel then indicating that the car is loaded, the doors closed and the elevator ready to be dispatched.

The central dispatcher can readily detach any elevator of his group from the operating board. It then can be operated directly from the car switch provided therefor, and still retain its automatic door opening and automatic leveling features. Until disconnected from the central board, however, the car switch remains inoperative.

Excepting for convenience, or when goods are being sent to a floor where no one is working at the time, no one needs to ride on the elevators for the purpose of operating the elevator or its doors.

The Micro-Leveling Elevator.

The elevator equipment described in this article is an epoch-making development in the field of vertical transportation. It represents the product of years of experience in elevator design and manufacture, and is the result of the combined genius of engineers and inventors. It is a well-known fact that with an automatic push-button elevator, in order to be adaptable for freight service where trucks are used for handling goods, the car platform must be brought to an accurate level with the landing and maintained there under all conditions of loading and unloading.

A push-button-controlled elevator has recently been developed which stops the car automatically with any desired accuracy and with any load within its capacity. When the position of the car changes during the loading and unloading, due to the lengthening or shortening of the cables, the car is automatically and quickly restored to the landing level. This remarkable accomplishment made it not only possible but more advantageous in this case to operate the freight elevators by a central dispatcher than by individual operators on each car. This new automatic elevator is known as the "micro-leveling elevator."

The hoisting unit consists of the main driving machine and the micro-drive mechanism. In the Brooklyn army base the main machine is of the worm gear type and is driven by a two-speed alternating-current motor giving full and one-third speed. The "micro-drive" consists of motor, brake and worm gearing of about one-tenth of the speed and power of the main machine. The micro-drive is mechanically connected to the main machine through the revolving electro-mechanical main brake. The slow motion of the micro-drive through the final few inches of travel in connection with a novel system of control, results in the car stopping level with the landing with any load to the full capacity of 10,000 lbs. Since the leveling is accomplished at slow speed and by means of the small motor, there is less wear and tear of mechanical and electrical parts than with an elevator of the ordinary type and the amount of power required for leveling is reduced to a minimum.

Micro operation is applied to car switch as well as automatic push-button control. In this case the operator throws his switch to the stop position on approaching the floor just as in the operation of the ordinary car switch control. If the car is within the micro zone, the micro-drive functions and stops the car level with the floor. Although the micro or leveling zone extends 8 in. above and below floor levels, in actual service the average micro movement is usually not more than 3 in.

Selective Automatic Door-Opening and Closing Machines.

The doors are operated by an ingeniously arranged mechanism which automatically opens the doors at the floor to which the car has been dispatched and as the car approaches that floor. As the door-operating machine starts to open the doors when the leveling zone is reached by the car, it is obvious that the leveling is accomplished while the doors are being opened and therefore no additional time is required for leveling.

The door-closing operation can be initiated only by touching a closing button either on the car or alongside the door opening on the floor.

Hatchway Doors.

The doors themselves represent a radical development in elevator hatchway doors. Consideration of the trailer truck problem pointed the way to doors of maximum height and rising from fixed sills. Due to the high door openings and limited story height it was necessary that the door-operating mechanism be so arranged as to first move the door horizontally into the hatchway a sufficient distance to clear the sill and door above and then to raise the door vertically to clear the opening.

These doors are made of a steel frame with panels ¾-in. thick of sheet steel and asbestos composition.

In case of emergency the cars can be run with the doors open.

Piershed Elevators.

Ships are unloaded in part on both piershed levels and goods in transit between the warehouse and first transfer shed level reach or leave the latter on trailer trucks via the eighteen automatic elevators with which the sheds are equipped. These elevators are operated

individually by means of buttons on each floor and in the car. In all other features they duplicate the warehouse elevators.

The army supply base was constructed for the traffic storage and purchase division of the War Department. Quartermaster General Goethals, director of this division, appointed Cass Gilbert as architect thereof, under whose direction and supervision the original conception was fostered and developed. The actual construction was carried on by the Turner Construction Co. under the construction division of the War Department, under the command of Brig. Gen. R. C. Marshall, Jr. Lt. Col. H. S. Crocker was constructing quartermaster.

Much credit is due both the Turner Construction Co., general contractor, and the many sub-contractors, who have made a wonderful record in bringing the plant to a state of practical completion in the limited time at their disposal. The elevator installation was made by the Otis Elevator Co.

While designed and built primarily for government service, a prominent warehouse and terminal operator who has been identified with the Brooklyn army supply base has recorded his belief that the solution of some of the most difficult problems confronting operators of commercial enterprises of this class lies in following the government lead here, inasmuch as he considers the Brooklyn base in every way an ideal plant.

WESTINGHOUSE WAR MEMORIAL SCHOLARSHIPS AWARDED.

Four Young Employes Win Competitive Tests for Memorial Scholarships and Select Engineering Courses at Prominent Technical Colleges.

The awards of the four annual War Memorial Scholarships of $500 each, established by the Westinghouse Electric & Mfg. Co., have just been announced. These awards were made by competitive examinations and the following men were successful:

Herbert S. Pahren, Cincinnati, O., employed as order clerk in the Cincinnati office of the Westinghouse company, and a graduate of the Hughes High School, who has selected for his scholarship a technical engineering course at the University of Wisconsin.

Arthur Marthens, of East Pittsburgh, began work as a messenger boy before completing his studies in the Turtle Creek schools. Mr. Marthens, while working in the cost department, prepared himself in the Casino Technical Night School to enter college. He has chosen a course in electrical engineering at the Carnegie Institute of Technology.

Paul O. Langguth, a graduate of the Wilkinsburg High School and employed as draftsman in the engineering department at East Pittsburgh, has selected as his award an electrical engineering course at the University of Pittsburgh.

Andrew P. Lesniak, a graduate of the Union High School, Tuttle Creek, Pa., and employed in the production department at East Pittsburgh, has selected a course in mechanical engineering at the University of Pittsburgh.

Two classes of scholarships are provided:

(a) For sons of employes of the company or its subsidiaries who have been employed for five years or longer. (b) For employes of the company and its subsidiaries who have been continuously employed for at least two years and who had not, on Sept. 1, exceeded the age of 23. Not more than two class B scholarships will be awarded in any year.

Each scholarship carries with it an annual payment of $500 for a period not to exceed four years, the payment to be applied toward an engineering education in any technical school or college selected by the successful candidate with the approval of the scholarship committee.

These scholarships have been established as a memorial to those employes of the company and its subsidiaries who entered the service of their country during the war. Four awards will be made each year, so that after three years this company will be maintaining 16 of these scholarships in the best technical schools of the United States.

CHICAGO'S NEW ENGINEERING ADVERTISING ASSOCIATION.

Advertising Managers of Engineering Manufacturers Form Body to Improve Advertising Methods.

The Engineering Advertisers' Association of Chicago is a new organization whose membership is limited to advertising and sales executives of concerns engaged in the manufacture of engineering products.

This association was organized by a group of men actively engaged in the production end of advertising work, including H. L. Delander of the Crane Co., P. A. Powers of the Benjamin Electric Manufacturing Co., Glenn H. Eddy of the Green Engineering Co., J. J. Arnsfield of Fairbanks, Morse & Co., and Albert H. Hopkins of the C. F. Pease Co.

It was the judgment of these men that the advertising activities of manufacturers of engineering products have assumed such magnitude as to necessitate an independent organization devoted exclusively to this special field.

P. A. Powers, one of the directors, outlined the purposes of the Association as follows:

"We seek to improve present methods of advertising and selling engineering products by trying to bring the truth to bear upon our problems; by each one laying down his own methods and submitting to friendly criticism; by co-operating in various active efforts and by the interchange of ideas and experiences."

The committee in charge of the winter program has arranged for a comprehensive series of lectures which will be delivered at the monthly meetings by men who are recognized authorities on the subjects assigned. Such questions as better typography in engineering advertising, the use of art in advertising technical products, markets and their analysis, the kind of data which should be accumulated by advertising managers, and other very practical topics will be discussed by experts.

The membership now includes a great many of the members of the advertising profession who are prominent in their work. The control of the association is vested entirely in advertising and sales directors as it is the intention to limit the membership to men actively engaged in advertising and selling engineering products.

GLASGOW CORPORATION ORDERS EIGHT ELECTRICS.

The Municipal Corporation of Glasgow has just ordered 6 two-ton electric vehicles at $6520 each from Edison Accumulators, Ltd., and 2 electric vehicles at $5600 each from Electric Vehicles, Ltd.

Central-Station Rates in Theory and Practice

Twelfth Article — Discussion of the Results of the Mathematical Study of Price Splitting—Comparison of Different Modifications of the Value-of-Service System

By H. E. EISENMENGER

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This is the twelfth article of this series, which began in the issue of July 12. The first seven articles, constituting Part I, discussed the cost of central-station service, a knowledge of which is necessary before any rate system can be intelligently selected. In the two following articles were outlined the three general principles on which is determined the extent to which the different classes of customers shall contribute to the profit of the undertaking. Two and one-half articles were then devoted to Insert IX, *which was a mathematical study of the relations between selling prices and earnings. The present article gives a summary of the conclusions derived from this study and shows some of their applications. This will be continued in the next article and then rate systems will be taken up in the remaining articles, which will continue throughout practically all this volume.*

PART II—THE PRICE OF ELECTRIC SERVICE—Continued.

III.—The Value-of-Service Principle.

A. Advantages to the Public and to the Producers (Continued).

THE principal results of the investigations in Insert IX about price splitting are in brief words the following (Sections 81-86):

81. If we determine the prices for *every particle* of the service separately[1] in accordance with the value which the respective customer attaches to that particle, but with the restriction that the prices shall never be raised above the original price, this operation (price splitting downward) *must always* result in an increase of the earnings (whether gross income, net income or dividend), provided that no particle of service is sold at a price below a certain minimum. The amount of this minimum depends on the kind of earnings we have in view (gross income or net income or rate of return) and it is identical with the values given as lower limits in Section 74 (a), (b) and (c) for the "What-the-traffic-will-bear" system with the three kinds of earnings. These values are of necessity always lower than the original price, provided the latter has been chosen so that it does not result in negative earnings. (The above is proved in Sections 10-13 of Insert IX.) *Therefore profitable price splitting downwards will always be possible.*

This method of price determination would mean not only that the prices vary between different kinds of service and between different customers, but different particles of the same service would be charged differently to the same customer. For instance, every customer would have to be charged slightly differently for the first kilowatt-hour supplied to him for a certain kind of service than for the second one, and for the second differently from the third, etc. (see Section 73). The same would apply to the kilowatts of demand. The theory would, moreover, require that the kilowatt-hours used for kitchen lighting, for instance, be charged differently from those used for the lighting of the living room, and those used at 6 p. m. differently from those used at midnight because the valuation of these particles by the customer will probably be different.

82. As this theoretical method of charging is obviously impracticable we will in practice try to approximate it as closely as we can. We will combine into one group or class of service, or of customers, large numbers of such units of service of which we expect that there is approximately the same valuation on the part of the customer or customers. We then charge all units in the same class or group at a uniform price. Price splitting downwards will then mean lowering the prices for all units in one or more of the groups in such a manner that the prices remain equal amongst one another for all units in the same group, but they will differ between groups. We have therefore in this practical value-of-service system a hybrid between the theoretical value-of-service system and the cost-of-service system. We may, for illustration, charge all kilowatt-hours for heating service at the same price and differently from the kilowatt-hours for other than heating service. Or we may charge the first 50 kilowatts demand of wholesale power at certain fixed demand charges which are higher than those for the following kilowatts, etc. The more uniform the valuation is by the customer of the units within every group, that is, the more intelligently we select the groups and the larger we choose the number of the groups the more closely will this method and the results therefrom approximate the method of Section 81 and the results of that method.

This method of varying the prices, not between individual units but between groups, will be called "price splitting between groups."

83. The latter part of Insert IX (beginning with Section 15 of that Insert) contains a detailed investigation of the conditions under which price splitting downwards between groups is of advantage to the three different kinds of "earnings" (gross income, net income and rate of return).

The principal results of these investigations are the following:

1. The necessary and sufficient condition that

[1] For instance every kilowatt, every kilowatt-hour and every individual customer, respectively.

price-splitting downwards between groups shall increase the earnings is that the number of units sold in the group (or groups) for which the price is being lowered, increases more rapidly than the "profitable portion of the price" is being diminished by the price reduction[2]. The term "profitable portion of the price" means the excess of the price over the cost increment per unit[3] provided that the term "cost" (see Section 2) is defined in each case in the same way as in Section 75 (where we dealt with the lower limit of the prices permissible under the maximum earnings principle), that is:

Gross income...	Cost = 0; cost increment = 0.
Net income....	Cost excludes capital expenses.
Rate of return..	Cost includes capital expenses; cost increment includes the capital expenses of the increment capital figured at the same rate of gross interest which is obtained for the rest of the capital.

Other interesting and fundamentally different ways of stating the same law are found in Sections 16-19, 29-30 and 37-38 of Insert IX.

2. It follows from condition 1 of this Section that the prices can in no case be profitably reduced below the "cost" (as defined above), although we can find or construct special cases of sales curves[4] which bring the range of profitable price reductions as close down to that "cost" as we desire. In other words, the "cost" is the lower limit to which the price can profitably be reduced under any circumstances. With a given sales curve we can not reduce the price profitably lower than to a certain lowest limit which is greater than the "cost."

3. Condition 1 *must always* be fulfilled (this means price splitting downwards between groups is *always* of advantage to the earnings), if the price of the original cost-of-service system is at least as high as the price which results in a maximum of the respective aggregate earnings of all groups under the cost-of-service system. Condition 1, on the other hand, *may* be fulfilled if the price of the original cost-of-service system is lower than the above limit.

84. Stating the above laws in still shorter terms (which of course implies a corresponding further reduction of the accuracy) we can say: A lowering of the prices will improve the earnings if the price is lowered in those groups for which the sales rise sufficiently rapidly as the prices decrease. This means that price splitting downwards between groups is of advantage if one or certain ones of the groups show a comparatively heavy percentage of increase of sales in the range where the price is lowered. If the term "price splitting downwards" is to be understood in such a manner that the prices are reduced to one or more of the groups, whereas they are kept at the original value in at least one of the groups, we have to add the condition that at least one of the groups increases its sales only comparatively slightly for the price reduction in which the others show a heavy percentage of increase of sales. In other words, the groups must show a good differentiation between the shapes of their "sales curves," at least in the range of prices below the original price in which the price reduction will take effect. An instance of this kind is furnished by the two groups of lighting and heating service. If we reduce the price, the consumption of heating current and the heating demand will rise more rapidly than that for lighting service and therefore a reduction of the rates for heating current below those for lighting current will be proper, a thought which is borne out in a large number of rate schedules.

85. It will be the easier to classify the service and the customers into such well differentiated groups the more groups we have.

At the same time we can expect that under a cost-of-service system of charging, which has been intelligently devised from the producer's point of view, the price will be such as to furnish a maximum of earnings or at least that the price will not be far away from that value. With reference to Section 83, condition 3, we can therefore say that even under a system of price splitting by groups it will always be possible to increase the earnings by means of price splittings downwards.

It should be kept in mind that an ideal analysis of the total service into groups of service will be identical with a separate determination of the price for every particle of service and, as stated in Section 81, and proved in Insert IX, this will under any practical circumstances result in the possibility of increasing the earnings by price splitting downwards.

86. We can thus say generally: If the original cost-of-service system has been intelligently devised from the producer's point of view and if the classification into groups is intelligently made, *it will practically always be possible to raise the earnings by the introduction of price splitting downwards.*

87. Whereas we have seen (Sections 81 and 83) that price splitting can be carried out with advantage to the earnings as long as the prices do not reach below a certain lower limit, this must not be interpreted by any means to imply that we reach a maximum of the earnings by lowering the prices to that limit. On the contrary, carrying the prices down to that level would mean that we have lowered the prices so far that all the advantages gained by the reduction of the prices have been gradually reduced to zero and we are back at the same point—as far as the amount of the earnings is concerned—as before price splitting began. In order to obtain a maximum of the earnings the lowering of the prices must not be carried to that extreme but must be stopped earlier. (The exact amount to which the prices are to be lowered in order to procure the maximum of the earnings is discussed in Insert IX). In order to reach a maximum of the earnings the prices should in general be changed to a different level in every group. Where we are interested in price splitting downwards only, we effect a change of prices in those groups only where they should be lowered and in the other groups we leave the prices at their original level.

88. We go back now to our original problem of Section 78 and assume that we have had a system of charging under the cost-of-service system with the prices regulated in such a manner that the earnings are just what is considered fair, not so high that the public might be justified in demanding a reduction of the rates, nor so low that that part of the public which has invested its savings in the public service corporation finds the return for its capital and risks insufficient so that capital would be driven away to other more lucrative enterprises which would result in the ultimate damage to the consuming part of the

[2] If, for illustration, we contemplate a price reduction which reduces the profitable portion of the price to 2/3 of its original value, the number of units sold in the respective group must increase to at least 3/2 of the original amount (that is, to the reciprocal of 2/3) to make this price reduction advisable. The profitable portion of the price has then been reduced from 150% to 100% and therefore the amount of the sales must be increased from 100% to at least 150%. If the profitable portion of the price is reduced to 1/2 (200% to 100%), the number of sales must at least be doubled (100% to 200%), etc.

[3] See the first footnote of Section 75.

[4] For explanation of the term "sales curve" see Section 73.

public as well. Then we change over to the value-of-service principle by price splitting downwards only (and not upwards). According to what has been said in the preceding Sections (see Section 86) it will practically always be possible to do this in such a manner that the earnings are increased thereby[5]. We arrive thus at a system of charging which will be called for the sake of convenience "the first value-of-service system" or for short *"the first* system."

The upper part of Fig. 3 shows how the various consumers are affected by this change of charges. Fig. 3 refers to the sale of a certain particle or group of service, for instance to the first 50 kw-hr. of lighting service, or it might refer to the demand charges, for instance of the first 10 kw. of power service, or to any other reasonable subdivision of the service. This particle of service will be worth different amounts of money to different consumers, which means different consumers will be able and willing to pay different amounts for the respective particle of service. These amounts will be called hereafter the consumer's *"limiting price"* for that particle of service. This "limiting price" (in dollars or cents), which varies for the various consumers between zero and a certain maximum, is stepped off in horizontal direction in the various parts of Fig. 3 from the line *OO* to the right. Every consumer is charged a certain percentage of his "limiting price" and these percentages which the consumers are charged actually under the various systems represented in Fig. 3 and to be discussed presently, are stepped off upwards from the respective horizontal base line in vertical direction. Where that percentage is 100% or less the consumer will purchase the respective particle of service to which the diagram refers, otherwise he will stay away and not avail himself of the benefit of the central station's electric service. For those consumers who are buying the service under the various systems the area of the diagram is shaded, for all the others it is left empty, so that the shading shows at a glance how far the benefits of the electric service reach the different classes of the population.

In the cost-of-service system (top diagram) one price only is charged to all customers, therefore only one certain class of prospective customers will be charged just their limiting price (100%), all the others are charged either less (to the right of *PP*), or more than 100% of their limiting price (all prospects to the left of *PP*). The latter will stay away and not become customers under this system of charging.

If now price splitting is introduced within a certain range from the original price *OP* downwards, for instance in such a manner that the lowest price to be split off reaches as far down as P_1P_1, all customers whose limiting price is in that range will be charged their limiting price. Thus (see the second diagram from the top in Fig. 3), all customers whose limiting price is large enough as to reach beyond the line P_1P_1 but not large enough to reach beyond the line *PP* are charged just their limiting price (100%), those to the right of P_1P_1 are charged a smaller percentage, and the prospects to the left of P_1P_1 would be charged more than 100% of their limiting price and will therefore not be customers. Under this system which will be called *"the first value-of-service system"* we have added as customers all prospects whose limiting prices are in the range between P_1P_1 and *PP* (compare the shaded ranges of the two top diagrams in Fig. 3).

If now the splitting of prices for the "first value-of-service system" has been made in such a manner that the total earnings of the company are increased thereby (see Section 86) and if, on the other hand, we want to preserve the amount or percentage of earnings which has been considered fair before price splitting was put into effect, we will have to modify this "first value-of-service system" by introducing price reductions.

89. We might reduce *all* prices in the same fixed ratio so long until the excess of earnings has disappeared. In that way every one of the consumers would be positively benefited by the introduction of the value-of-service system. Let this be called the *"second system."*

This reduction would mean that certain customers at the lower end of the scale would be added which could not be reached under the former prices. The customers added will be those whose limiting price is greater than the lowest one of the new prices, but smaller than the lowest price of the first value-of-service system (see Fig. 3, System 2, shaded portion to the left of P_1P_1).

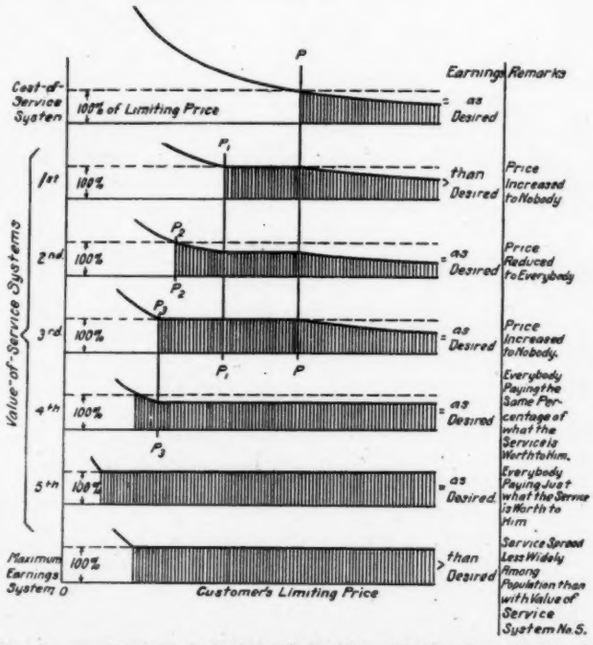


Fig. 3.—Comparison Between Cost-of-Service System, Value-of-Service Systems, and Maximum Earnings System.

90. Or *("third system")* we might leave unchanged the prices that are charged to the existing customers under the "first system" and add new lower prices for those customers only who have not been able and willing to pay the prices of the first system for the respective service. This means that those consumers who had been customers under the cost-of-service system (that is, the customers to the right of *PP*) are not benefited by the introduction of this (third) value-of-service system, but neither do they lose. They simply continue to pay the price they were charged under the original cost-of-service system (and under the first value-of-service system). This is the disadvantage of the third system compared to the second where all customers are positively benefited by being allowed a price reduction. The advantage over the second system is that a certain por-

[5]It will be shown later (last sentence of Section 92) that this fact, though helpful for the understanding of the evolution of the value-of-service principle, is not altogether essential.

tion of the public can be supplied with service that had to forego the benefits of electric service under the second system[6] (between P_2P_2 and P_3P_3 in Fig. 3).

In this third system all consumers pay for their service just as much as they are able and willing to pay, with the exception of those consumers who are charged the highest price, that is the price of the original cost-of-service system. These customers pay less than 100% of their "limiting price." (See Fig. 3, to the right of *PP*.)

91. Unless we insist that the changeover to the value-of-service system shall avoid raising the price to any customer over the price paid under the original cost-of-service system there is no logical reason why those customers who are reaching up to that arbitrary dividing line *PP* of the original "cost-of-service price" should be exempted from the rule which applies to all other consumers, namely that each consumer shall pay not more and not less than what the service is worth to him. Under the "third system" those customers who would be willing and able to pay the highest prices of all are charged less than their limit (whereas all the others are charged just their limit). We can therefore go another step forward and *raise* the prices to that class of consumers so that every customer has to pay just what the service is worth to him. This permits of a subsequent further reduction of the prices and, if the earnings are, as assumed, to be kept constant, such a reduction is even necessary.

We can again choose two methods for this subsequent reduction, in analogy to the two methods applied in developing the second and the third system. Either we reduce all prices by the same percentage, so that each customer[7] pays the same percentage of what the service is worth to him *("fourth system")* or we add another set of prices at the lower end of the scale extending this set downwards so long until the excess of the earnings has been swallowed *("fifth system")*. This means new consumers are taken on for the service in question for whom even the lowest prices charged heretofore have been prohibitive.

It should be noted that if we carry the value-of-service principle in this manner to its ultimate consequences (fourth and fifth systems) this amounts to a "maximum-earnings system" (see Section 65) with these modifications (compare Fig. 3):

(a) In the fourth system the prices are reduced to all consumers[8] by a certain fixed percentage below the price charged under the maximum-earnings system. This percentage applies alike to all customers so that every customer has to pay the same percentage of what the service is worth to him. The minimum price must not be identical with that of the maximum-earnings system; it may be higher or lower.

(b) In the fifth system every customer has to pay 100% of what the service is worth to him, but the prices reach further down than with the maximum-earnings system. Under the maximum-earnings system we must refuse to make any sales at prices so low that they would reduce the total earnings (see Sections 72 and 74), whereas under the fifth system we go deliberately below that limit with the intention of reducing the earnings to the desired limit.

92. It is of interest that with none of the five systems are we bound in any way by considerations of the cost, as far as the individual price is concerned. The individual price may reach down even below the increment cost; with the fifth system the prices are even bound to reach below that limit. The consumers for whom the service is of higher value make up for the reduced profit or even loss caused by others.

Each one of the six systems (original cost-of-service system and five value-of-service systems) in the order named carries the benefit of electric service further into the population than the preceding system.

We see also from the above deductions and from the diagram Fig. 3 that, unless we want to avoid raising the prices to any customers (Systems 1 to 3) we arrive at the same ultimate systems (4 or 5) regardless of whether it is possible to employ price splitting downwards with an increase of the earnings, or not.

93. The beginner should clearly understand that the above is a theoretical investigation based on the assumption that we have a full and definite knowledge of how the sales vary with the prices. Its object is to get an insight into the general effect and the possibilities of an intelligent value-of-service system (see Section 67). The five systems are five steps or stopping points, chosen with a certain degree of arbitrariness to explain the evolution and the effects of the value-of-service principle. But in practice the knowledge referred to above is a thing not to be thought of. We can therefore in practice not distinguish between the five systems as clearly as we can in theory. Practical price-making in general is necessarily always based on business instinct and even guesswork, and so is the practical application of price splitting in particular.

All we can do in practice is to grant lower prices to those groups of service which, as for instance heating and cooking service, can be expected to increase their sales with decreasing prices much more rapidly than others, for instance lighting service. At the present average price which is charged for general lighting we have reached a certain degree of saturation of lighting service. Although a reduction of the price for lighting current to one-half or one-quarter of its present average value would undoubtedly increase the use of electric light, yet it would not increase it by nearly as much as a reduction to the same price would increase the use of electric heating because the present *lighting* rates are almost prohibitive for electric heating and cooking, except for some small appliances, largely as a luxury or convenience rather than a necessity. Therefore we will conclude that a reduction of the price—or rather of the percentage profit—for heating and cooking below that charged for lighting service is generally advisable. There are of course other considerations, such as the complication of the rates or the necessity of a separate meter, which may make it undesirable to create a separate rate for heating and cooking (to remain at the example chosen) and all this requires good judgment on the part of the rate maker to decide whether he should use under the given local conditions a separate rate or one of the other methods for the same purpose (Wright rate, number-of-rooms rate, etc.) to be described and discussed in the following

[6] That System 3 must actually bring service to such customers as have lower limiting prices than the lowest served under System 2 (in other words that P_3P_3 must be situated to the left of P_2P_2) becomes evident if we imagine System 3 to be developed out of System 2 by raising all prices between P_2P_2 and *PP* to 100% of the limiting price and raising all prices to the right of *PP* accordingly until they reach the corresponding prices of System 3. These increases of prices without any accompanying reductions must necessarily result in an increase of the earnings because none of these price increases has been carried beyond the 100% limit so that all the consumers who have been customers under System 2 will remain customers under System 3. To offset this increase of earnings and to bring the earnings down to the desired normal height we have to add new customers to the left of P_2P_2 by offering prices to them which are low enough to attract them.

[7] With the exception of those added at the lower end of the scale by the last reduction. (See Fig. 3, System 4.) Those customers pay a higher percentage.

[8] With the exception of those who are paying the very lowest prices (see diagram).

ones of this series of articles, or whether it might not be better to entirely forego a diversification of the profits. The latter practice is found as a rule more in smaller companies where simplicity of the rates is paramount, but as the knowledge of the principles of rate making is spreading this practice has a tendency to disappear.

B. Factors Determining the Customer's Valuation of the Service.

94. It has been said above that the value-of-service principle distinguishes between different kinds of service according to the monetary value attached to the service by the customer. This monetary value constitutes the upper limiting value for the price, and the value-of-service principle endeavors to make the charges with due consideration of this limiting value for the various parts of the service and the various customers.

Now this limit of the monetary value beyond which the customer will not purchase the respective part of the service depends on two factors: (1) The value he places on the service, that is the degree in which the service is necessary, useful, profitable or convenient to him; and (2) the value he places on money.

The first factor is determined by a variety of circumstances, among which the possibility of obtaining a similar service from some other source and the quality and price of such competitive service are prominent. This factor can vary for the same customer between different parts of the same service. Thus, for instance, a customer will generally value artificial heating service more in winter than in summer. (In the latter case he will even place a negative value on it as he would pay for having heat removed.)

The second factor is to a large degree determined by the amount of money which the customer is able to spend (and is willing to spend). That is, it depends—apart from the customer's economic inclinations—on the degree in which the customer (or the class of customers) is blessed with worldly goods.

(To be continued.)

PUMPING WATER FOR IRRIGATION MAKES IMPORTANT POWER LOAD.

Hundreds of Orchards in Washington Watered by Pumping Plants Supplied by Hydroelectric Power—Types of Pumps Used.

By W. A. Scott.

The Wenatchee Valley Gas & Electric Co., of Wenatchee, Wash., operates a 2-unit 1500-kw. hydroelectric plant on the Wenatchee river at Dryden, and a similar plant of 1025 kw. on the Entiat river. Its system is supplemented by the 800-kw. hydroelectric plant of the Chelan Falls Power Co., on the Chelan river at a point above where that stream empties into the Columbia.

The Dryden plant is equipped with S. Morgan Smith water turbines and Westinghouse generators, operating under a head of 55 ft., the water being delivered through 6100 ft. of canal and two penstocks 100 ft. long. The Entiat plant has two units; this plant operates under a 78-ft. head, the water being carried to the turbines by 6800 ft. of canal and through a penstock 1750 ft. long. The Chelan Falls plant contains an Allis-Chalmers generating unit, driven by a turbine of the same type as the others. The 800 kw. here is developed by water pressure at 35 ft. head. The transmission line by which the Chelan Falls energy is tied in with that of the Wenatchee system is 20 miles long, the connection being made at Entiat. The three plants have a combined capacity of 3125 kw.

This output appears to be fully consumed, especially during the five months from May to September, inclusive. During the spring and summer seasons there is a load of about 1200 hp. in electric centrifugal and triplex pumps to raise water from the rivers and canals for irrigating land. There are at least 150 pumps on the company's lines, of which 36 take irrigating water from the Columbia river. Pumps on that stream make an average lift of about 125 ft., and some of them are of a capacity to deliver 1000 g.p.m. In a river installation the pump has to be set in a pit inclosed by a concrete wall to protect it from being submerged during high water, and so that the suction will not average greater than 15 ft.

Besides the pumping and lighting service, the company has a connected load on its lines of 200 hp. for motors in shops and small factories in Wenatchee.

Relative to pumping service for irrigation in the Columbia, Wenatchee, Entiat and Chelan valleys, in Chelan and Douglas counties, it may be observed, of course, that such service is for benches of land not under gravity canal systems. The orchards thus irrigated contain from 50 to 100 acres each, and with the permanent water supply afforded by a river it is considered that pumping water to a maximum height of 400 ft. is economically permissible. But the electric power lines by no means cover this field. There are a great many triplex and centrifugal pumps being driven by oil and distillate engines in upriver localities outside the range of the electric power lines. Hydroelectric possibilities on all the streams which enter the Columbia between Wenatchee and the international border are practically unlimited, and as such development goes on the use of motors for driving pumps will take the preference over other kinds of power as a matter of convenience and economy. Regardless of the installation of systems for delivering water by gravity canals, there will always be in this valley a great deal of pumping for irrigation to cover tracts of land on benches not reached by gravity supplies. Then, the orchardist who has his own pumping plant on a river enjoys a certain independence, even though the cost by pumping is greater.

Pumping requirements, whether with electric motors or oil engines, consist of a 500-gal. pump for a 50-acre tract and a 700 to 1000-gal. pump for a 100-acre tract. But, it is observed, the tendency is to use the centrifugal rather than the triplex pump for high-head operations. The triplex is belt-driven, whether operated by a motor or an oil engine; and among the great number of motor-driven centrifugal pumps in this field, those direct-connected and those belt-connected are about equal. On pumps requiring belt drive the balata belt is largely used. For installations in which the motors are direct-connected to centrifugal pumps the speed is about 800 r.p.m. on those of small capacity, while on larger units the speed is usually about 1200 r.p.m.

A motor-driven, belt-connected, 10 by 10-in. triplex pump of the capacity of 500 g.p.m., delivering water against a head of 350 ft. through a 10-in. discharge pipe, requires a 50-hp. 2200-volt motor. These specifications apply to an installation considered typical. Another installation, considered typical, is one in which a 40-hp. 2200-volt motor is direct-connected to a 600-g.p.m. centrifugal pump operating against a 127-ft. head through a one-mile line of 10-in. pipe.

Electric Trucks and Tractors in the Iron and Steel Industry

Industrial Electrical Apparatus Offers Many Advantages for Use in Smelting Plants, Foundries, Etc.—Handling Problems of This Industry — Need for Employing Good Operators

By BERNARD J. DILLON

THIS is the fourth of a series of articles dealing with the application of electric industrial trucks and tractors in representative industries. In this their application in foundries, smelters, etc., is described. This is generally regarded as the greatest of all industries and its widespread adoption of electric handling apparatus indicates the reliability and desirability of such devices. Although the operating conditions are unusually severe and exacting, practically every installation has proven successful and resulted in substantial savings. On account of the present disturbed labor conditions of this industry the problem of increasing the use of labor-saving appliances takes on special timely importance.

THE use of electric industrial trucks and tractors by the iron and steel industry began when this apparatus was first introduced and has grown rapidly ever since. Beginning with the application of a single machine, in most cases its reliability and the advantages which it offered for this class of work were quickly recognized and now many of the largest and most successful installations are in use by this trade.

Growth of the use of this apparatus has, of course, been particularly rapid during the past few years. During this period the iron and steel industry was called upon to produce to its utmost capacity in spite of the extreme labor shortage that existed. As a result, electric apparatus was introduced into practically every kind of handling by concerns in this industry and the results have exceeded all expectations. At present it is largely a matter of the extent of their possible application rather than a question of whether or not they should be employed.

The general handling problems of this industry are especially adaptable to the use of electric trucks or tractors. The plants usually are composed of a number of long one or two-story buildings and cover a large area. This greatly increases the average hauling distance, which gives the electric a decided advantage.

The class of material handled also adds to the desirability of the electric. Generally, it is very heavy and cumbersome and cannot be readily loaded on the ordinary two-wheel hand truck. Nor can dollies or flat trucks be used due to the rough passages and the great weight of the loads. For the smaller pieces a wheelbarrow is usually used as a carrier. This is, of course, a very strenuous and tiresome method and it is difficult to get labor to perform it. For the larger and heavier pieces cranes or hoists are used, but it has been found their field is limited when compared with the truck or tractor for many classes of work. This phase of handling is discussed further on in this article.

Saving in labor and production cost, however, is the principal advantage offered by the electric apparatus. There is no question now but that this apparatus saves a large amount of labor which enables it to pay for itself in a short time. The labor problem generally has affected this industry more than any other. In the first place, a large amount of unskilled help is required for certain operations that cannot be replaced by mechanical devices. The scarcity of this class of labor has made it necessary to employ automatic machinery as extensively as possible and free as much of this help as could be obtained for this other work. In addition, the wages demanded by this labor have greatly increased, which has also been an important factor in stimulating the introduction of labor-saving devices. Moreover, the introduction of such apparatus has a certain moral effect which causes the employes to be more satisfied and contented, for it indicates a desire on the part of the management to make the work as easy as possible and the savings effected enable it to grant higher wages.

Handling Problems of Foundries, Smelting Plants, Etc.

The amount of handling and trucking entering into the operation of foundries, smelters, etc., is considerable. The raw material and fuel must be brought to the furnaces, taken from the furnaces to the moulds or mills and dumps, and from the moulds or mills through a series of mechanical operations to clean and finish it before it can be delivered to the machine shops or shipping room. Numerous other materials must also be handled, such as sand for the moulds.

Traveling cranes and hoists are used extensively for this work in many places. Where the materials handled are heavy and must be piled or placed upon machines or cars higher than the floor level, these are indispensable and their only competitor is the electric truck equipped with a gantry crane similar to the one shown in one of the accompanying illustrations, which can often be used to advantage for handling objects of medium weight. The operations of a crane or hoist, however, are generally confined to one building or area and outside of that place some other method of handling must be employed. They are also limited by the fact that volume of handling cannot be increased beyond a certain amount and still handled efficiently. Moreover, they are expensive and not adaptable to all classes of buildings and cannot be moved to another

building easily. As was stated, they are indispensable for certain classes of work in the performance of which the ordinary electric truck or tractor offers no competition. Before installing additional crane equipment, however, it is often advisable to study the situation and find out how much of the work now being handled by the crane can be handled by a truck or

Electric Truck and Trailers Hauling Materials in Foundry.

tractor. It has often been found that by using this apparatus for as much of the work as possible in conjunction with crane facilities, an extra crane will not be required.

The trucking conditions in the iron and steel industry are unusually severe. Passageways are narrow, congested and rough. Most of the material handled is by no means fragile, yet it cannot be subjected to unnecessary roughness, and in addition much of it, the moulds for example, must be handled with extreme care. Speed, of course, is an important factor in many of the operations and accurate running and spotting are also essential.

All these requirements and conditions can be met better by the electric than hand labor by reason of its greater power and better control. The laborer pushing a heavily loaded truck or even a wheelbarrow can not be expected to slow down and ease its load over a bad spot in the passage nor can he guide it accurately through a difficult narrow passage. The electric truck or tractor operator, however, has perfect control of his machine and its load at all times and has all its power at his disposal. He can slow down at a bad spot and start up again without exerting any extra effort and by means of the flexible steering arrangements now installed on such machines can negotiate narrow passageways easily and quickly. In addition, the congestion and confusion caused by the use of large number of hand-operated trucks is considerably relieved when all the work is done by hand.

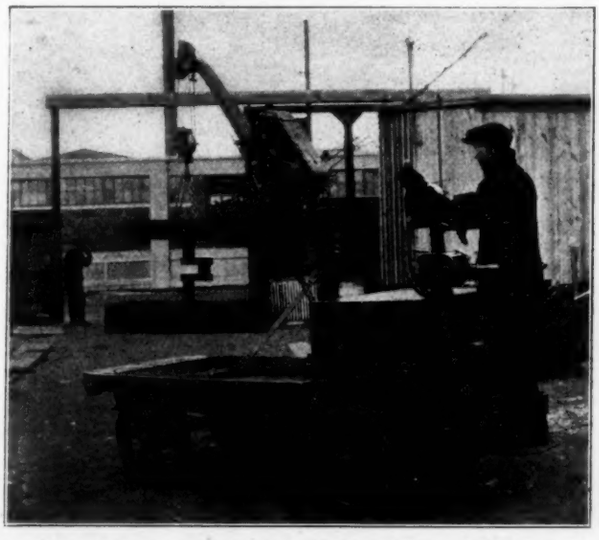
Advantages of Electric Industrial Apparatus for Various Handling Operations.

The raw material or ore and the fuel for the furnaces is usually dumped directly from cars or boats onto piles or into a suitable storage place. This is usually quite a distance from the furnaces, and for transferring it to the furnaces the electric tractor and trailers offer many advantages. Trains of trailers can be loaded at the storage piles, picked up by the tractor and taken to the furnace. When they are unloaded they can be taken back to the fuel piles again or loaded with by-products or ashes to be taken to the dumps. In the meantime other trailers can be loaded. In this way the loading or unloading operation is continuous and the tractor can be employed all the time.

Trailers can also be equipped with metal ladles for carrying the hot metal from the furnace to the moulds. These can be hauled by the tractor to the different places and the pouring operation completed quickly and efficiently. This method is also very safe for the operator can stop and start very quickly and is able to avoid obstacles much easier than a crane.

For hauling the castings from one operation or department to another, except in the larger plants where this distance between the departments is very great, the elevating platform or lift truck is generally preferred. The moulds when they are formed are set upon suitable skids. After the metal is poured these skids are lifted up by the elevating platform and taken to the point where the sand is knocked off. As the sand is removed, the casting is placed upon another skid which in turn is taken to the next operation, usually a saw. Here the process is repeated—that is, casting is taken from one skid, the necessary work done and either placed upon another skid or replaced upon the same skid. If the castings are not small, two skids are used in order that the operator will not have any extra handling. This process is repeated through the tumbling, polishing, finishing and other operations until the casting is ready for shipping or machining.

The advantages of the lift truck for such work can be readily appreciated. Not only is the trucking cost greatly reduced but the maximum manufacturing efficiency can be obtained. The operators can be kept constantly supplied with material and no time is lost by the operators in getting or waiting for work. The machines can also be kept in constant operation. As the skids can be placed in the most advantageous position by the truck, all unnecessary handling is elim-



Combination Electric Truck and Hoist for Handling Heavy Materials, Such as Large Castings.

inated. Electric tractors can also be used with trailers in place of skids but a certain amount of extra handling is involved as the trailers cannot be spotted as accurately as the skids.

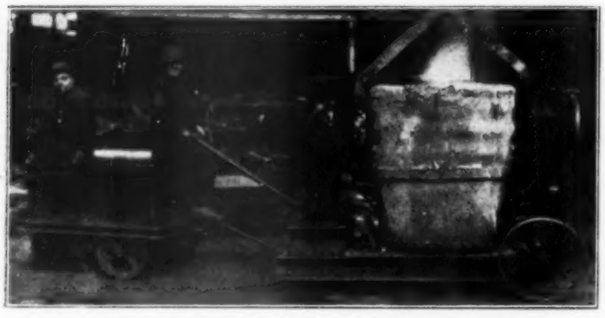
The amount of actual savings effected by either the truck or tractor will, of course, vary, depending upon local conditions. Even in the smaller plants,

however, this saving is considerable. In many plants the saving in increased production alone is sufficient to more than cover the expense of the apparatus, leaving the entire labor saving as profit.

In the handling of moulds, etc., where special care must be taken to avoid any unnecessary jars, a special skid has been designed which is in use by many concerns. This skid is equipped with springs which relieve the mould of all the jarring and make it comparatively easy and safe to transport them.

Good Operators Especially Desirable for Such Work.

It is particularly desirable that good operators be employed to handle the trucks or tractors used in this industry. As has been stated, the handling conditions are unusually exacting and severe. A careless, inefficient operator not only reduces the value of the machine but he is unsafe and apt to cause more damage than can be saved by its use. Moreover, the management of concerns in this industry must realize that although the machines are easy and simple to use and their operation can be learned by anyone in a short time, they are nevertheless valuable machinery and proper results can only be obtained by employing conscientious, careful, reliable operators. The operators should be carefully selected and the entire responsibility of the apparatus should be assumed by



Electric Tractors Prove Useful in Handling Foundry Ladles.

them. In return, they should be given a satisfactory wage. In addition, there should be a rigid rule enforced prohibiting anyone, except the operator, to use the truck or tractor.

It should be remembered that these machines replace a large amount of hand labor but in any case this handling must be done. If the operator through carelessness puts his truck out of commission, the old handling methods must be resorted to, which is not always easy because such laborers have usually been discharged or put upon other work. It is also advisable to keep on hand a supply of extra parts and have someone in the plant who is familiar with the operation and construction of the apparatus in order that no time may be lost in making the necessary repairs.

MODERN SHINGLE MILL REQUIRES MOTOR DRIVE THROUGHOUT.

Features of a Seattle Plant in Which Electric Power Is Produced—Machines of Rapid Speed and High Capacity.

The modern shingle mill in the Northwest is characterized by electric drive, rapid speed and high capacity. The machines employed are easily adapted to motor drive and in the case of a number of such mills the electrical energy is produced at the plant by steam-driven generators.

A good example of the up-to-date shingle mill is found in that of the Phoenix Shingle Co., situated on Washington ship canal, Seattle, in which there are 12 Sumner upright shingle machines of a total capacity of nearly 400,000 shingles in 8 hours.

The power house contains two horizontal, tubular boilers of 150 hp. each, in which mill refuse is used as fuel. The steam produced is utilized in driving the turbogenerators and for seasoning shingles in the dry kilns. A General Electric 300-kw. turbogenerator, operating at 3600 r.p.m., produces energy at 480 volts, which is transmitted through overhead cable to a junction box in the shingle mill, and is distributed thence to 440-volt motors. In addition to this, the turbine room contains a 35-kw. turbine and a small motor-generator set, for excitation of the large generator and to supply direct-current energy for a motor that drives an air pump. The 300-kw. turbogenerator runs condensing, the exciter unit running noncondensing.

The 260 motors in the mill represent a connected load of 501 hp. The largest motor is of a 75-hp. machine which operates an 86-in. cutoff saw at 600 r.p.m., and the chain-belt log-haul by which the logs are brought from the canal up to the mill deck. The motor is belted to a lineshaft which is belt-connected to the cutoff saw, with another belt connecting with the log-haul mechanism. The cutoff saw and log-haul are not operated in unison, but alternately. A system of conveyors for moving shingles and disposing of mill refuse requires four belt-connected motors, the belt pulleys being of sizes to reduce the speed of conveyors. Practically all other motors are direct-connected to the driven machines by means of flexible couplings.

Following the cutoff saw in proper sequence is the bolter saw, or splitter, driven by a 35-hp. motor, and knee-bolter, driven by a 25-hp. motor. The material thus prepared goes to the shingle mills, each machine consisting of a shingle saw driven at 1800 r.p.m. by a 20-hp. direct-coupled motor, and a clipper saw driven at like speed by a 3-hp. motor. Both motors in the unit are controlled by one starter. The 12 machines arranged in a row and running in unison at this high speed give an interesting demonstration of their capacity for turning out shingles.

Each shingle machine produces a considerable amount of fine wood dust, which if not disposed of becomes very injurious to the operators. The dust generated by all the machines is drawn away through 4-in. metal ducts by a 72-in. suction fan, driven at 500 r.p.m. by a 20-hp. motor, the latter having a speed of 1200 r.p.m. The fan discharges the dust into a conveyor through which it passes to the refuse burners under the boilers.

The file room is served by a 5-hp. motor, belt-connected to a lineshaft from which one large machine for filing the cutoff saw and two smaller shingle-saw machines are operated, an emery wheel on each machine being driven at high speed in filing operations. The mechanism and automatic action of these machines in filing one sawtooth after another in rapid succession are examples of ingenuity which the needs of this industry has developed. All electrical equipment was furnished by the General Electric Co.

The red cedar shingles, which are the products of this mill, are kiln-dried for 10 to 12 hours prior to marketing them, the kilns in this case consisting of four compartments of brick construction, each 124 ft. long and 17 ft. wide.

Phoenix Shingle Co. is controlled by F. E. Ward, W. A. Batley and J. L. Batley.

Editorial Comment

Era of the Electric Furnace

THIS is the era of the electric furnace and the present is only the beginning of that era. During the World War the electric furnace for the making and refining of steel came apace in every country making steel for bellicose purposes because steel so made enables difficult conditions to be met more readily than steel made in any other way. It was likewise during the war that the electric furnace for brass melting made its appearance upon a practical scale. Considerable work had, of course, been prosecuted for many years previously on electric brass-melting furnaces, but it was during the war that this work culminated in the development of a furnace that could be called practical enough for commercial application.

When the war came, the price of zinc soared many hundred per cent, and the large waste of this metal as volatile matter gave great impetus to the perfection of a suitable electric furnace because of the very much smaller loss of zinc as compared to other methods of melting. In some quarters the high price of oil was also a factor. Today, the activity in the electric brass-melting field is as great as ever. Whereas, the steel industry—hence the electric steel furnace—is suffering somewhat from the reaction of its former activity, and the unsettled labor conditions, the electric brass furnace is still in such demand that that demand can not be filled. This is a form of load that central stations should find easy to acquire today. And it is a form of load that is usually well worth while.

Apart from those furnaces employing the higher temperatures, there are furnaces that might perhaps properly be called ovens, where the temperature is high, but not so high as that required for melting of steel. For example, there are the soaking pits and the annealing ovens of the steel mill, some of which are already heated electrically. Here is another phase of the electric furnace that is predestined to play a large part in the central-station industry and the steel industry in time to come.

Another opportunity that awaits the electric furnace is that for the melting and refining of glass. In such a furnace the difficulties would seem to be those of refractories and contamination of the glass charge rather than of anything else. When the urgent need for pure glass for optical purposes came with the coming of war and the supply of German and Austrian optical glass was interrupted, Great Britain, and later this country, turned to the electric furnace as one of the possible solutions to the problem of pure glass. Experiments are still being carried on in many different quarters, but it may probably be safely said that to date no practical form of electric glass-melting furnace has made its appearance for commercial use. Meanwhile, the work of inventing and investigating still goes on and will go on until the electric furnace for melting and refining of glass can be classed with the electric furnace for the making of brass and steel. This is but the beginning of the electric-furnace era.

The Storage Battery for Stand-by Service

VISITORS to the vast systems of the large central-station companies are shown the boilers and their stokers, the turbogenerators and the aisles of their control apparatus, the manholes and the steel towers and the substations of converting equipment. But it is not often, unless special request is made, that the storage battery for stand-by service is seen. And yet the stand-by storage battery is the watchdog of many a system, safeguarding a direct-current network or an exciter system.

Every large city with its congestion and dense population and buildings operating Edison three-wire networks has its stand-by batteries. Every large generating station has its batteries, a last reserve should their exciters fail. They are indispensable. Yet one hears little of this important piece of apparatus, although on a unit cost basis it is an expensive one. The reason for this is probably that the stand-by storage battery does its work without noise, without commotion and directly it is called upon to do so. Moreover, those that know are often not anxious that it be known that anything had happened to necessitate falling back on the stand-by capacity. It is not spectacular, even if it comes to the rescue stupendously. The storage battery is to the direct-current network or the exciter system what the reserve troops are to the attacking army. It saves the day, however unexpected it be, when the need arises.

All the large cities have their storage batteries for stand-by service. Detroit, with its largest storage battery in the world; Chicago, Brooklyn, New York, Philadelphia, Boston, Baltimore, Rochester, Cleveland, and in far-off Los Angeles and Spokane, all having direct-current networks have stand-by batteries. In checking up the capacity of these batteries, on the basis of percentage of maximum direct-current peak, it is found that there is a great difference in the different installations. In one case it may be that the battery is intended to take the place of an entire station taken out of service. In another it may be that the battery or batteries are sufficient to carry load that might be served over cables traveling a certain route. In other cases attempt is made to have even a higher

factor of safety. In all cases the battery capacity, amperes discharged for one hour, is only a small percentage of the total capacity it would be called upon to replace.

Just what percentage of stand-by capacity is justified depends of course upon conditions of transmission, of distribution, of generation, the importance of the load served, and the estimated time and magnitude of the shutdown during which the battery would be called upon to play its part. However, something happens somewhere every now and again that emphasizes the soundness of the investment in a stand-by storage battery. Because an emergency may appear remote there may be a natural tendency to reduce the investment in batteries; as deterioration occurs the factor of safety originally existing is lowered. Such a policy may be a very unwise one from every aspect.

Many power contracts include a forfeiture clause in case of cessation of service. An extended cessation may easily approach if not exceed in this item of cost alone the investment for one year upon a stand-by battery. The storage battery for stand-by service is really an emergency investment.

The stand-by battery may be an emergency measure. But it is doubtful if under conditions as they exist in many of our largest cities a central station would be justified in foregoing such a reserve capacity, however remote might be the emergency. It is not a question of prestige. It is not simply a matter of agreement to maintain uninterrupted service. It is not merely a matter of dollars and cents. It is the moral responsibility for safeguarding public safety. When the lights go out, when the ventilating fans and the elevators cease to move, and the fire pumps become useless things in the department store with its several hundred employes and its several thousand patrons, fire hazards threaten and the horrors of panic come nearer. A storage battery may save all these things and more.

Low Rates for Electric Cooking Found Profitable

IT has long been known that to make electric cooking on a large scale economical to the average residence customer of central-station companies the latter must offer a much lower rate for cooking service than for lighting service. Those companies that have been lukewarm in their support of electric cooking have contended that the low rates that were evidently necessary could not be profitable and that a very considerable portion of the cooking load would overlap the lighting load in winter and therefore make the peak load still more formidable. If these contentions were true, they would warrant the companies in going slowly and justify their Missourian attitude of "Show me."

There has just come to hand copy of a paper on electric cookery presented last week before the convention of the Colorado Electric Light, Power and Railway Association by Mr. Pierre L. Miles, who has devoted many years to actively pushing electric range sales and studying the possibilities of cooking service as a central-station load. As the result of extended investigations he finds that the diversity-factor and load-factor of the electric range load are far better than those of the residence lighting load and that only 10 to 15% of the total connected range load will fall on the present station peak in the winter months. Further he finds that a certain station generating capacity will serve ten times as large a connected range load; likewise a distributing transformer of 15 kv.-a. will serve a group of 20 ranges having a total connected load of 120 kw. These figures show extraordinarily favorable diversity-factors and lead him to assert that 200 electric ranges can be installed in nearly every small town without increasing the present generating capacity. The investment to serve a range customer is not as great as that required for a lighting customer.

As regards the profitability of this load, Mr. Miles finds that it is much more profitable than residence lighting and that the yearly revenue per kilowatt of generating capacity for range service is also greater than that serving a small-motor load. He states that there is more profit in selling cooking service at a profit of one-half cent per kilowatt-hour than in a profit eight times as great per kilowatt-hour for residence lighting service. He also says that a three-cent cooking rate can be justified against a five-cent small-motor rate on the basis of being more profitable.

These statements are such striking refutation of the arguments often advanced against the range load that we repeat them here because we know they were not made without careful investigation. They show conclusively that it will pay every central-station company to give renewed consideration to the advisability of pushing the electric cooking business. We believe that there are but few companies that will not find it a profitable load, these including combination gas and electric companies and those forced to compete with natural gas or cheap artificial gas. We have discussed herein only the question of economy to the range user and profitability to the central station. The other benefits of electric cooking of course add to its value very greatly, but cannot be readily evaluated when the question resolves itself exclusively to one of relative economy and profit.

Incidentally the findings of Mr. Miles bear out very strikingly also the conclusions of Mr. H. E. Eisennenger in his articles on "Central-Station Rates in Theory and Practice," that are appearing weekly in our columns. He shows mathematically that it is often profitable for a central station to reduce rates for one class of service without raising them for any other class and that all classes are decidedly benefited thereby. His conclusions in this regard are explained more in detail (and in simpler language than the mathmatics of his last few articles) in the article appearing this week.

Current Events

Municipal Electricians, Electrochemists, Central-Station Managers and Steel Industry Electrical Engineers Convene

MUNICIPAL ELECTRICIANS HAVE SUCCESSFUL CONVENTION.

Timely Papers, Interesting Addresses and Inspection Trips Make Meeting Very Profitable to Delegates.

An attractive program taken with the fact that after-the-war conditions permitted a large attendance of delegates resulted in making the twenty-fourth annual convention of the International Association of Municipal Electricians, held at Chicago Sept. 23-26, one of the most successful ever held by that organization. Papers of timely interest to their profession, interesting inspection trips and good entertainment formed the program, the feature of which was an address by Dr. Charles P. Steinmetz and an illustratrated talk by W. D'A. Ryan.

The title of Dr. Steinmetz's address was "Municipal Electricians in Relation to Electric Power Engineering." He stated that a municipality has a great deal in common with its public utilities, that its interest in the central station or the street railway system is akin to that of the stockholders because the city loans part of its property to the utilities and because their success is necessary for the progress of the community. It is necessary for municipal electricians to study this situation, especially in view of the fact that specialization is becoming more distinct in electrical matters in order to gain efficiency. For this reason electric power generation is becoming a separate industry. Civilization demands materials and their distribution. These will be secured by electricity and the outcome will be vast networks for electric power distribution and of railways. In the discussion Dr. Steinmetz indicated the Bureau of Standards would be greatly instrumental in drawing up rules for standard electrical construction and operating practice since the generation and distribution of electric power was assuming national and in some cases even international characteristics.

W. D'A. Ryan illustrated his address on "History of Illumination" with several hundred colored stereopticon slides which gave a picturization of the art of lighting from primitive to modern times. The development in illuminating methods and facilities was illustrated by a group of pictures taken at the Panama-Pacific Exposition, Mr. Ryan explaining the means employed to obtain the many different lighting effects produced there. These are noteworthy because they show the possibilities that exist for using artificial light in conjunction with art. Slides showing the street-lighting systems at San Francisco and other cities were also shown, and stress was laid upon the point that municipalities should endeavor to have their street lighting beautify the community as well as illuminate it. He concluded with the statement that cities having systems of luminous arc lamps should not be hasty in displacing this equipment because of its utility and efficiency. The address was warmly received and at its close Mr. Ryan was made an honorary member of the organization.

In his presidential address, C. E. Diehl reviewed in detail the work of the organization during the year and congratulated the membership on its loyalty during the war-time period.

Dr. M. G. Lloyd, electrical engineer, Bureau of Standards, Washington, D. C., in speaking on "High-Voltage Pole-Line Construction for City Streets," stated that there is undoubtedly a tendency toward the use of higher voltages because of the manifest economies resulting therefrom, some of which, however, are offset by the necessity for more expensive construction. City authorities are likely to receive more frequently requests for permission to have high-tension lines of 11,000 volts or higher pass through city streets. Such permission may well be granted on account of the economic advantages, provided that proper measures are taken in the construction of these lines to safeguard against their attendant hazards. Careful provision must be made against contact with persons, with low-tension circuits, such as telephone, signal and lifting circuits, and with grounded metallic structures of any kind.

Dr. Lloyd said that the types of construction called for in Part 2 of the National Electrical Safety Code meet all these requirements, and this part contains a mass of information that city electricians can well afford to make themselves familiar with when called upon to pass on any proposed line. He worked out in detail the method of determining the stresses on a typical heavily loaded pole, this having been taken from actual data from a line in one of the Chicago suburbs. Not only must the pole be of ample strength to withstand the wind and storm stresses under the most unfavorable conditions, but guy wires must have ample strength to carry the entire strain. In all cases the stress must not exceed one-half of the ultimate strength of the pole or wire. Dr. Lloyd also referred to the survey conducted this summer on typical heavily loaded poles in many parts of the country; this was made jointly by an engineer of the Bureau of Standards and one representing the National Electric Light Association, and secured data covering conditions as they actually exist prior to the revision of Part 2 of the Safety Code. Many poles were found overloaded, many underloaded, but in general the construction seemed to be well proportioned for the loads imposed.

In the report of the Standardization Committee, Chairman R. A. Smith, Norfolk, Va., resubmitted the revised reports on Class A standards dealing with fire-alarm telegraph systems and Class B on police signaling systems. The committee has found that 85% of American and Canadian cities are using equipments as described in the reports on these two classes, which had been reported at the convention last year. He, therefore, urged that the association accept these standards as recommended or good prac-

tice. On motion this was done. Mr. Smith also submitted standards for Class C—being regulations covering the construction and repair of installations for heat, light and power. This consisted chiefly of a summary of important features that should be included in municipal ordinances covering these matters. Under rules for inspections, it is recommended that the National Electrical Code be followed respecting fire hazard, and the National Electrical Safety Code followed as to life and accident hazard. The committee has in mind the preparation for standards for Class D dealing with electric lighting, and Class E dealing with electrolysis and metering.

In presenting a paper on "Electricity in Police Work," W. L. Potts, Detroit, outlined the important functions of electrical apparatus in police signaling and told of methods used in his city.

The paper on "Chicago's Novel Fire Alarm System," by W. G. Keith, commissioner of gas and electricity, Chicago, disclosed that the system is very antiquated, some of the apparatus in use having been installed just after the fire of 1871. It is proposed that the old system will be displaced by a dual system of police and fire-alarm apparatus, the principal features of which were outlined. The discussion was concerned with the construction and operation of the boxes, which will be of special design to accommodate both police and fire-alarm signals.

R. J. Gaskill, Fort Wayne, Ind., past-president of the association and a captain in the Signal Corps, A. E. F., read a paper giving first-hand statistics regarding the work of the Signal Corps during the war. He emphasized the importance of signal work in the winning of the war.

Inspection trips included visits to the Underwriters Laboratories and to the plant of the Kellogg Switchboard & Supply Co. Fire pump tests were conducted at the municipal pier for the benefit of the delegates.

A report of the concluding sessions of the convention will be made in next week's issue.

ELECTROCHEMICAL ENGINEERS HOLD THIRTY-SIXTH GENERAL MEETING IN CHICAGO.

Large Attendance and Pleasing Blending of Business and Pleasure Mark Convention.

The thirty-sixth general meeting of the American Electrochemical Society was held at the Congress Hotel, Chicago, during September 23 to 26 inclusive. The society held several joint meetings with the American Institute of Mining and Metallurgical Engineers, also convening at the Congress Hotel where the Electric Furnace Association also had a meeting.

A number of interesting inspection trips to steel mills in the vicinity of Chicago were postponed on account of the situation created by the strike of steel workers. On the afternoon of September 23 the A. E. S. held a joint meeting with the A. I. M. & M. E. at which was taken up matters pertaining to iron and steel. The papers presented were those on "Blast-furnace Refractories" by Raymond M. Howe, "Determining Gases in Steel and the Deoxidation of Steel" by J. R. Cain, "Effect of Time and Low Temperature on Physical Properties of Medium-carbon Steel" by G. A. Reinhardt and H. L. Curtis. Papers by H. D. Hibbard, Albert Sauveur, A. E. Bellis and G. F. Butterworth on "Effervescing Steel," "Aircraft Steel," "Erosion Tests of Rifle Barrels," and "Metallography of Rifle-barrel Steel" respectively, were read by title only.

In the evening a joint session was also held when papers by T. W. Robinson on "Industries of the Chicago District," "Manufacture of Steel Rails" by Robert W. Hunt, and "The World's Largest Plate Mill" by C. L. Huston, all of the A. I. M. & M. E., were presented.

Wednesday morning a meeting was held at the Exposition Auditorium at which several papers were presented. These consisted of a paper on "Manganin" by M. A. Hunter and J. W. Bacon; "Depreciation of Small Dry Cells with Age," by A. J. Helfrecht; "The Effect of Amalgamation Upon the Single Potential of Aluminum," by Louis Kahlenberg and J. A. Montgomery; and "The Effect of Amalgamation Upon the Single Potentials of the Binary Alloys of Aluminum with Copper, Zinc and Nickel," by Louis Kahlenberg and J. A. Montgomery.

The Wednesday afternoon session was devoted to a joint session with the A. I. M. & M. E. devoted to the general subject of ferrous and non-ferrous metallurgy. Of the A. E. S., F. A. J. Fitzgerald presented a paper entitled "Radiant Resistor Furnace," and "Electric Furnace for Experimental Work"; A. M. Clark one on "Electric Heat" and H. G. Weidenthal on "A Square Deal for the Electric Furnace." C. H. Fulton and G. P. Hulst, of the A. I. M. & M. E. presented papers entitled respectively "Electric-resistance Furnace of Large Capacity for Zinc Ores" and "Treating Antimony Ores." A number of other papers were presented by title only. Abstracts of the above articles on electric furnaces and dry cells will appear in the ELECTRICAL REVIEW at an early date.

Wednesday evening was devoted to an inspection of electric furnace exhibits at the Coliseum where the Fifth National Exposition of Chemical Industries was held during the week. At the Auditorium a moving picture show was a feature of the evening. One series of pictures showed the resistance type of electric furnace melting non-ferrous metal. Another reel supplied by the Electric Furnace Co. showed the electric furnace in the heat treatment of essential war materials, while another film furnished by the Detroit Electric Furnace Co. depicted the Detroit rocking furnace in operation melting brass. Still another film showed the power development and industries that have sprung up around the system of the Shawinigan Water & Power Co., Canada.

SYSTEM TROUBLES CAUSE UNPRECEDENTED SHUTDOWN IN CHICAGO.

Series of Troubles Cause Extensive Damage and Derangement to Vast Network.

What was the most serious shutdown in the history of the Commonwealth Edison Co. occurred on the afternoon of Sept. 18. The exact cause of the origination of the trouble has not been given out, if it is definitely known. Indications are, however, that line trouble caused a surge to start, which persisted for considerable time until it had assumed such magnitude as to necessitate taking out of service what generating units had not already tripped out on the section of bus affected.

At 3:45 p. m. a severe disturbance occurred on the 25-cycle system. Three 9000-volt transmission lines opened automatically at the Fisk Street station, and three 10,000-kw. turbogenerators tripped out. The

behavior of another 10,000-kw. unit and a 20,000-kw. unit operating on the same bus section was such that they were taken off the bus by the operator. Two 25,000-kw. turbogenerators at the Northwest station also tripped out and a 35,000-kw., 60-cycle unit at the Fisk Street station then had to be taken off the system because its 25-cycle auxiliaries had dropped out following the loss of the machines previously placed *hors de combat*.

The severe jolt to the 25-cycle system and the loss of 25-cycle generating capacity resulted in practically all the synchronous converters supplying the "loop" or downtown territory with direct current shutting down. What machines did not fall out of step due to the severe jolt, shut down because of lack of alternating-current supply. The shifting of load from station to station, voltage drop and current surging in the direct-current network caused a very large number of fuses to blow. At Randolph Street substation one converter failed to open automatically and its armature was burnt up, causing a fire and such quantities of smoke that the operator was unable to resume operation again until 5 p. m., while fire fighters had to wear gas masks in fighting the fire. At the Plymouth Court substation one converter regulator burnt up and converters at the East Madison Street, West Division Street and Ohio Street substations were slightly damaged. During this time a number of railway substations were shut down from 2 to 14 minutes. Several manholes in the downtown district caught fire, in one case the cover being blown off with considerable concussion. The tie lines and several feeders between the Adams Court and East Madison Street substations were burnt open.

Service in the "loop" or downtown district was interrupted in some places where fuses had blown. In others the voltage was low and very badly unbalanced. The 23 standby storage batteries installed in the Commonwealth Edison Co.'s various downtown substations were called upon for high rate of discharge, in an emergency unprecedented in the history of the company. These batteries, having a rating exceeding 95,210 amperes for 1 hour at 250 volts, saved the day until those stations shut down only because of the system disturbance could start their synchronous apparatus again or obtain transmission lines. However, the storage battery capacity was only a drop in the bucket and low pressure could not be prevented entirely. Nevertheless they prevented complete interruption of service where fuses held intact.

At about 5:30 p. m. another disturbance occurred when three high-tension underground transmission lines opened automatically at Fisk Street. A number of railway substations were shut down at this time until they could get started again, while three distant substations served by 20,000-volt underground cables were shut down about three hours. After this second trouble occurred it was found that two underground lines had broken down in a manhole close to Fisk Street station and that one of these and another line had also broken down between the generator bus and their current transformers, a condition which prevented the circuit-breakers from functioning, and it was necessary to open these lines by hand. The breakdown in the manhole was so severe that all the 18 transmission lines passing through it had to be taken out of service. It was later found that several bus insulators at Fisk Street were cracked.

None of the generators were damaged. Synchronous converters, as already mentioned, suffered somewhat. A number of high-tension lines and direct-current feeders were burnt and a large number of fuses had to be replaced. The derangement of service was surprisingly small, likewise the damage suffered to equipment. The trouble or series of troubles gave the severest test to the company's relay protection system, its distributing system and also to its efficiency in personnel. All met the test and it is this fact that enabled service interruptions to be localized, the time of interruption minimized and practically all apparatus to be placed back in service again.

TIMELY TOPICS DISCUSSED AT EDISON ILLUMINATING COMPANIES' MEETING.

Many Important Questions Brought Up at Annual Convention of Association at New London, Sept. 16-18.

As announced in our last issue, the 38th convention of the Association of Edison Illuminating Companies was very successfully conducted at New London, Conn., on Sept. 16-18 of last week. Being the first gathering of this body since the close of the war, a large attendance was present and took active part in the proceedings.

In opening the convention on Tuesday morning, President L. L. Elden, of Boston, made an address reviewing the work of the association and commenting on the importance of the principal topics to be presented at the convention. He dwelt especially on the present chaotic condition of rates with their various coal clauses and surcharges to cover increased operating costs, and on the advisability of offering off-peak rates for secondary service. Other features mentioned by Mr. Elden were the labor situation, interconnection, water-power legislation and development, and standardization of equipment.

After the reports of the Executive Committee and treasurer were presented, Wm. C. L. Eglin, of Philadelphia, read the report of the Committee on Standards, of which he was chairman. This discussed chiefly the pending revision of the National Electrical Safety Code and advocated delay therein to give those interested a better opportunity to study the proposed changes. The conference on industrial safety codes held at the Bureau of Standards last January was also reviewed, together with the two proposed methods of drawing up safety codes for different industries. The report of the Committee on Metering and Service Methods, O. J. Bushnell, Chicago, chairman, was presented. It dwelt principally on some new developments in demand meters; the desirability of issuing more complete customers' handbooks or service leaflets was also pointed out and an outline of subjects therefor suggested.

D. S. Boyden, of Boston, presented a paper on "A Uniform Policy for Making Distribution Circuit Extensions and Service Connections to Consumers." This gave a summary of a questionnaire among member companies as to their practices and showed widely differing policies and procedure in this regard. The tenor of all replies indicates that the policy in making extensions and service connections is much less liberal than before the war, and that at the present time they are passing through a transition period and, with few exceptions, have not yet reached any definite policy for normal times. It therefore seems psychological that there should at this time be advocated a uniform policy covering extensions and service connections to consumers. The foregoing does not apply to street lighting or large consumers supplied from unregulated transmission lines. Development of good

will should result from a more uniform policy in this regard.

"Dielectric Power Loss and Ionization Voltage in Underground Cables," was the title of a paper presented by F. M. Farmer, of New York City. The origin and significance of dielectric losses were discussed, also conditions affecting this loss and methods of measuring it. Similar treatment was given to the subject of ionization voltage. The power loss should be as low as feasible, since this permits a higher rating. Change of the dielectric loss with temperature should be a minimum in order that the critical temperature where the normal conditions become unstable will be as high as possible to permit of emergency overloads. The ionization voltage marks the limit of the voltage at which a cable can be operated without risk.

Tuesday evening was devoted to a discussion of lamps and central-station lamp practice. The report of the Lamp Committee, J. W. Lieb, chairman, was the annual compilation rich in original data of the quality and performance characteristics of incandescent lamps, large quantities of which are purchased by members of the association under test. Following the report there was a symposium on central-station lamp-renewal practice participated in by the following: Louis A. Ferguson, vice-president, Commonwealth Edison Co., Chicago; J. T. Hutchings, president, Rochester Railway & Light Co.; Robert Lindsay, vice-president and general manager, Cleveland Illuminating Co. (presented by Dr. McClellan); W. F. Wells, vice-president, Brooklyn Edison Co. The four companies represented by executives in this symposium have adopted different attitudes toward the supply of lamps to their customers. These papers were discussed by J. W. Lieb, Walter H. Johnson, T. I. Jones, C. L. Law, Alex Dow, C. L. Edgar, John W. Howell and others. The advantages and disadvantages of the several plans of lamp handling were put forward in the course of these discussions which extended until the midnight hour. There was a practical consensus, however, in favor of vigorous educational activity with a view to demonstrating the advantages to the public as well as to central stations of the more intelligent and liberal use of light, and it was emphasized that whatever the practice of the company in the handling of lamps, considerable advance can be made along this line.

At the Wednesday morning session the report of the Committee on Rates, Alex Dow, of Detroit, chairman, was presented and discussed. This report covered chiefly power rates, rates for interchange of power between companies and rates for resale of power by customers. A supplementary paper was presented at the request of the committee by James V. Oxtoby, of Detroit, on "Status of the Customer Whose Service Requires Large Investment," this dealing with the legal phases of the question and commenting on court and commission decisions on this matter.

Wm. C. L. Eglin, of Philadelphia, read a paper on "The Personnel of the Industry." A plea was made for more systematic development of all plans relating to the compensation and general welfare of the personnel. Among topics discussed were hours of labor, wage rates, collective bargaining, trade unions, employment of women and minors. Establishment by each company of a personnel bureau was advocated.

The report of the Committee on Electricity Distribution and Use, R. F. Schuchardt, Chicago, chairman, discussed in a general way possibilities for development of the industry along these lines. Among subjects commented on were interconnection to secure conservation of resources, the necessity for a single frequency for this purpose (the committee finds no real objection to making 60 cycles standard), preference of alternating-current extensions instead of direct current, timeliness of taking up power-factor correction seriously, application of electric supply to electric vehicle and railroad service, to industrial, domestic, and agricultural service, and the necessity for industrial research.

On Wednesday evening a session was held at which three papers of general interest were presented. The first was "Lessons of the War in the Conduct of Government Business," by M. O. Leighton of Washington, D. C. This paper dwelt at length first on the gross inefficiency of our Federal Government in normal times with its numerous duplications of work by different departments and bureaus, general inertia and lack of modern business methods. When we entered the war in April, 1917, not only were we unprepared but the Government machinery was utterly unadapted to handle the big emergency and the extraordinary work it involved. After a few months of chaotic floundering, the necessity for calling on the American business men familiar with handling large affairs was realized and the War Industries Board and other similar bodies presently began to function, building up an efficient and co-ordinated organization capable of doing the work promptly and economically. Mr. Leighton mentioned instances, notably the Construction Division of the Army, wherein civilian engineers housed a million men in three months although the military men said it was utterly impossible. Since close of the war, the departments and bureaus are languishing back to their former inertia and inefficiency and the lessons of the war are apparently being forgotten. In closing, Mr. Leighton made a strong plea for support of the proposed Department of Public Works, which should take over all of the engineering and scientific activities of the present Federal departments.

An address on "War Undertakings and Developments in the Industry During the Past Three Years" was presented by Francis Pratt, vice-president of the General Electric Co., in which were reviewed the principal developments and contributions of that company. On account of lack of space this address will be summarized in an early issue.

F. Darlington, of the Westinghouse Electric & Manufacturing Co., presented an address on "Vision in Power Development and the Test of War." This dealt with the National Government war-time point of view regarding utilization of power, which was that the expansion of centralized electric power systems was the only effective and efficient way of securing increased power. Central-station development has reached a stage where the best and most economical method of supplying power for practically all purposes is by large interconnected central electric systems covering interstate areas which constitute natural power-service districts. The Government vision of unified power supply does not contemplate radical departures from latest technical practice but rather a new view of the utilization of power. The paper also considered financial, political and social conditions resulting from such a unified plan.

At the concluding session on Thursday there was presented the report of the Committee on Steam Plant, H. P. Liversidge, chairman. This included an extended discussion on steam-turbine reliability and

considerable matter dealing with boiler-room practice. A paper by Geo. A. Orrok on "Some Phases of the Fuel Problem" was presented, also one on "The Supply and Distribution of the Fuel of the World, Particularly of the United States," by Prof. L. P. Breckenridge; one on "Fuel Oil," by C. R. Weymouth, and one on "Pulverized Fuel," by Fred A. Scheffler of the Fuller Engineering Co. The latter discussed the use of pulverized coal by central station and other power plants and clearly demonstrated the fact that there is nothing mysterious about such applications. There are now in daily operation over 100 boilers in the United States using pulverized coal and the same equipment can use and has used such different fuels as Texas and Colorado lignite, Wyoming Oklahoma and British Columbia coals, Illinois screenings, bituminous and anthracite slack.

The election of officers of the association for the ensuing year resulted in the choice of the following:

President, W. H. Johnson, vice-president Philadelphia Electric Co., Philadelphia, Pa.

Vice-president, M. S. Sloane, Brooklyn, N. Y.

Secretary, Percy Miller, New York, N. Y.

Treasurer, Ernest A. Edkins, Chicago, Ill.

Executive Committee; Charles L. Edgar, Boston, Mass; W. W. Freeman, Cincinnati, Ohio; Samuel Insull, Chicago, Ill.; John W. Lieb, New York, N. Y.; Joseph B. McCall, Philadelphia, Pa.; and the president, vice-president, secretary and treasurer, ex-officio.

PRESIDENT BALLARD ON ACTIVITIES OF THE N. E. L. A.

In Letter to Northwest Association He Reviews Current Central-Station Problems and What N. E. L. A. Is Doing to Help Solve Them.

President R. H. Ballard of the National Electric Light Association on Sept. 6 sent to H. J. Gille, president of the Northwest Electric Light and Power Association, a letter regretting his inability to attend the annual convention of the latter organization at Seattle, Wash., this week and incidentally discussing what the N. E. L. A. is doing to help solve present-day central-station problems. The Northwest Electric Light and Power Association is a geographic section of the N. E. L. A., and Mr. Ballard's letter, which was read before the Seattle meeting, was in line with his policy of having the national association represented directly, if possible, at each of the geographic gatherings so that the latter may know what is being done by the national organization. Mr. Ballard's letter contains so much of interest that it is reproduced below substantially in full.

MR. BALLARD'S LETTER.

It is with keen regret that I am compelled to advise you of my inability to be present at the annual convention of the Northwest Electric Light and Power Association to be held in Seattle, Sept. 24 to 27.

Conventions of geographic sections are of particular interest to me and I had looked forward to an instructive and enjoyable visit with you all at your meeting, especially in this, the Pacific Coast year of our National Association. We are pulling so strongly together to assist in solving some of the big national problems confronting our industry that a personal visit would have given me the keenest pleasure.

Engagements to attend the conventions of the Southeastern Section at Asheville, N. C., and the New England Section at New London, Conn., both of which are scheduled for this month, together with meetings of the Executive and Public Policy Committees in New York require my presence in the eastern part of our country for the next six weeks.

President A. Emory Wishon of our Pacific Coast Section and some other prominent Californians are planning to be with you at your convention, and I am asking Mr. Wishon to represent me officially.

It has been said that the reconstruction period through which we are now passing is even more trying than the five years of actual world warfare. The effects of the war are being felt now from both economic and psychological standpoints. Economically the operation of the law of supply and demand would work out the situation were it not that this law is obstructed by certain unpatriotic action, familiarly known as profiteering. Psychologically, the public mind is still affected by five years of anxiety and it is but natural for it under these circumstances to react to all kinds of extremes. It seems to me that the need of the time is for us all to go forward with courage in the regular pursuit of our business, laying stress upon the necessity for more production, more economic saving and more conservation.

Water-Power Development.—One of the big conservation measures is the development and use of water power, thus serving the double purpose of securing an additional and inexhaustible supply of electric energy for new industries and releasing for other purposes an exhaustible supply of fuel.

Our Association has appointed a new general committee to deal with this question of water-power development. Mr. Franklin T. Griffith, president of the Portland Railway, Light & Power Co., has accepted the chairmanship of this committee.

Electrification of Railroads.—Another conservation measure which will come more gradually is the partial electrification of steam railroads, especially over mountain passes. Our central stations must be prepared for this when it comes, in order that the best economy may be attained by combining the electrical demands of the railroads with the regular commercial demands of central stations, thus securing the maximum benefits of diversity and putting the generating stations to their greatest use during all hours of the day. A strong committee is being organized to deal with this subject.

Municipal Ownership.—Interconnections of transmission systems traversing large areas irrespective of political subdivisions, cities, or even counties, has demonstrated the fallacy of municipal ownership of electric systems with their lines confined to single municipal areas. It is this broad distribution and these conditions of diversity which make possible the substantially lower average rates to consumers from large privately owned systems, and in a measure account for the development and use of electric energy from privately owned systems being some twenty times that consumed from municipally owned systems in our country.

Reliable statistics of these conditions will be compiled by a committee of our national organization, and this service should be of great value to members of the Association.

Service and Public Information.—With the regulation of electric utility rates to provide only sufficient return on capital investment to attract new capital to meet the constant demands for expansion and development, and with a courageous attitude on the part of state regulating bodies to see that such reasonable return is allowed to utility companies, the electric industry is free from politics and may devote its entire energies to its duty of adequate and comprehensive service to the public. Broad, honest and courteous service at every point of contact with the public makes for contented and satisfied consumers. We all know that a sound, substantial income, as the result of good service to contented patrons, is much more to be desired than income based on unnecessary consumption of energy and indifference to the real interests of our consumers.

That the general public may be better informed regarding this attitude of electric utility companies, a Committee on Public Information is being organized. Mr. John F. Gilchrist, vice-president of the Commonwealth Edison Co., of Chicago, has accepted the chairmanship of this committee.

Mr. S. M. Kennedy, general agent of Southern California Edison Co., will contribute much to the year's work in the capacity of chairman of the Committee on Service.

Co-operation in the Industry.—There never was a time in the history of our industry when harmony and earnest co-operation between all of its branches was more to be desired than now. Mr. Lee H. Newbert, commercial manager of the Pacific Gas & Electric Co., of San Francisco, has accepted the appointment as chairman of the Committee on Co-operation in the Industry, and will associate with him on this committee representatives from all branches of the business to outline a plan under which the maximum results of general co-operation may be obtained.

Welfare of Employes.—Employes' participation and the possibility of the workers becoming part owners in our industry is now a recognized fact in the electrical business as well as in the industrial life of America. No general plan or universal scheme of participation seems possible or practical

for the reason that the conditions of no two undertakings are identical. A plan which has been very effective in practice provides for the purchase by employes on small installments of capital stock or securities of the properties with which they are identified. Interest on deferred payments is generally carried by the concern at ordinary interest rates, but the employes receive dividends at a higher rate in proportion to the earnings of the properties and consequently acquire a vital interest in the success of the business. In this way thrift is combined with ownership and participation and a strong incentive is given for increased production, accompanied by saving. Enduring benefits resulting from the participation of workers in the business in which they are engaged cannot go beyond the sharing of profits or earnings. To place the management of the industries in the control of those untrained in the administration of such affairs would result in disaster, frustrating the very ends which co-operation is seeking to achieve.

The granting of pensions on retirement of the workers in old age, and for disability benefits to those who have served well, but may have become disqualified for service, is another great feature of employes' welfare.

Geographic Sections.—In our Geographic Sections, the greatest opportunity is offered for personal contact and interchange of ideas between executives and employes and all others interested in the electrical industry within a given territory where conditions are frequently identical and usually similar. From these, ideas naturally germinate and spread to the National Association, which are becoming transcontinental policies and aims. In the Geographic Section opportunity is offered men to think in broader terms, and for cementing all branches of the industry in one harmonious whole by a complete understanding between central stations, manufacturers, jobbers and contractor-dealers, as to the rightful place occupied by each group, and especially the relations of one branch of the industry to the other. The Geographic Section is the place where misunderstandings, frictions, petty jealousies and fancied injuries can be ironed out and adjusted. It also opens ample opportunity for constructive initiative and a medium of crystallization, demonstrating and applying locally when local, and making universal when universal, all of the constructive and creative forces that exist in the minds of the great membership of the National Electric Light Association.

SOUTHEASTERN SECTION, N. E. L. A., HOLDS MEETING AT ASHEVILLE.

Addresses, Papers and Trips Make Pleasing Convention for Delegates.

During Sept. 17, 18 and 19, the Southeastern Section of the National Electric Light Association held its annual convention at Asheville, N. C. About 200 members were in attendance.

The convention opened its first session with about 100 present. A feature of this session was the address of Mayor Gallatin Roberts, who reviewed the history of transportation and lighting, going on to relate the manner in which Asheville and the local power and light company had grown up together. He laid special emphasis upon the friendly co-operation accorded the city by H. W. Plummer, manager of the Asheville Power & Light Co. C. D. Flanigen, president of the association, then reviewed the work of the association during the last year, stressing the importance of labor policies and other public policy questions.

C. Murphy Candler, chairman, Georgia Railroad Commission, in a very clever manner told of what utility supply really means and some of the difficulties under which utilities may have to operate. He emphasized two points—that it is the solemn obligation and high duty of a public utility to render good service and that the public should accord the utility fair treatment and just compensation. The very object of a utility is to serve. Tact, courtesy, discretion are virtues. Good service is more important than low rates, and there is less objection to rate increases when the service is good. Mr. Candler then explained that his commission had fixed maximum rates and minimum service, leaving leeway for the utilities to lower rates and improve service when they can.

"The servant is worthy of his hire," said Mr. Candler, as proving that every utility is entitled to a reasonable return upon its service—what it accomplishes. That means that the charge must not exceed the value of service rendered. Some of the difficulties in rate making were outlined, as some of the reasons why rates have had to be changed because of unprecedented and unforeseen conditions that have arisen. Efficient and adequate service goes hand in hand with reasonable and just rates, and together they mean a satisfied public, a fairly compensated and contented force of employes and a fair return upon the value of property dedicated to public use.

T. F. Johnson then presented a paper entitled "Live Line Maintenance." This paper was accompanied by a supplement showing the various tools and methods discussed. The buzz stick method of locating defective multiple-part pin-type insulators, how to feel out an insulator, testing out suspension insulators, feeling out a string of insulators, method of determining number of insulators required in a string for any voltage, number of men in crew for testing a line, various tools and their use, were each taken up in turn. Methods of changing insulators, making ties on live lines, etc., were also described.

In the evening the report of the Public Policy Committee was represented by W. H. Glenn, chairman. This was followed by F. G. R. Gordon's able and sensational address upon "The World Menace of State Socialism."

At the Thursday morning session, R. H. Ballard, president of the N. E. L. A., made an address upon the pensioning of retiring employes when they have qualified by long service and loyal effort. Mr. Ballard said that action taken by the California Railroad Commission had annunciated a new principle in the jurisprudence of the country. One of the largest electrical companies in that state had applied to the regulating body for authority to put into effect a pension contract, granting pensions to all of its employes upon reaching the age of 60 years, after a 20-year period of continuous service. The commission in confirming this application gave the pension plan the force and effect of a contract binding and collectible at law, and permanent beyond the power of any future management of the corporation to eliminate and beyond the power of any future regulating body to abrogate.

After quoting to some length the ruling of the commission, Mr. Ballard said: "Such a pension plan as has been given legal status by the Railroad Commission of California is the best thought-out plan of which I can conceive to drive away from our minds the goblins of dread, and give to the loyal worker the fullest opportunity to develop his initiative and achieve his highest potentialities."

Following Mr. Ballard, F. C. Hamilton presented a paper entitled "Rate Reduction in the Last Three Years," in which it was shown that after considering the lack of a standard measuring stick of value, the intrinsic value has not changed the depreciation of the purchasing power of money, that a reduction in utility rates has actually occurred. The necessity of rate restoration instead of rate increase was advanced by Mr. Hamilton, he then pointing out that labor unions appreciate fundamentals that utility men neglect and why electric utilities have been late to suffer from time lag of rate change to care for conditions as they exist today. A number of court decisions

are given bearing upon property value of public utilities. It is stated that the trend of prices upward is permanent and that with the purchasing power of money declining, there is no choice but to raise the selling price of the finished product or face bankruptcy.

"Safeguarding the Employe" was the title of the next paper, presented by H. L. Parish, Durham Traction Co. Mr. Parish discussed the past and future safety movement and explained the manner in which this work should be taken up by companies. General points for safety are then given, safety records are reviewed and the awarding of prices advocated, as are also medical examination, physical exercises, lectures and meetings.

J. Prince Webster then gave his interesting talk on "The Smiling Complaint Man," a talk that contained from beginning to end pithy and sound advice as to the manner of handling complaints. Several different methods of handling complaints by different companies were described and the morals pointed out. This paper will be abstracted in a future issue of the ELECTRICAL REVIEW.

Thursday afternoon and evening were devoted to recreation, there being wide choice in the way of golf, a visit to the Country Club, a tea dance, a band concert and an airplane trip for those that wished to go. In the evening there were moving pictures and a dance.

On Friday morning the business and final session was held. A paper on "The Grounding of Secondaries" was read by L. V. Sutton, Carolina Power & Light Co., who explained the present status of grounding secondaries, why it is done and how it should be done. Comparative advantage of different ways of grounding, the copper plate, iron pipes, etc., and methods of testing the resistance of grounds were given. Specifications for making and maintaining grounds were presented. W. M. Stearns then read a paper upon "The Marsh Patent and Its Effect on the Heating Appliance Industry" in which the litigation, the agreements between the Hoskins and the General Electric interests and their influence upon the heating industry were explained.

A meeting of Class A members and of the Executive Committee was then held, after which the session was adjourned and the convention came to an end.

ACTIVATED-SLUDGE SEWAGE-TREATING PLANT TO REQUIRE MUCH POWER.

Langdon Pearse Describes Problem of Treating Chicago Packing-House Wastes and Plans Proposed for Its Solution.

A general summary and details of one of the most acute problems in sewage disposal were explained to the Western Society of Engineers, at a meeting in Chicago on Sept. 22, by Langdon Pearse, engineer of the Sanitary District of Chicago. Mr. Pearse's talk was entitled "The Packingtown Waste Problem" and dealt with the very aggravated situation in the Union Stock Yards of Chicago where in an area of a little over one square mile there is formed as much sewage as by a city of over 1,000,000 inhabitants. The solution proposed is a treating plant to be operated exclusively by electric power and involving a connected load of about 12,000 hp. and using approximately 38,500,000 kw-hr. annually.

Mr. Pearse stated that the Chicago stock yards had been established in 1865, growing steadily until now over 12,000,000 cattle, hogs and sheep are slaughtered annually. From the cattle pens and slaughtering houses from 50 to 75 tons of solid organic matter are discharged into the sewers daily, consequently the sewage is very "strong." Up to the present time the scheme of diluting this sewage on its discharge into the Chicago river and Sanitary canal has been followed, but on account of national and international questions involving control of the levels of the Great Lakes, it is anticipated that the dilution method has reached the limit of its capacity and, therefore, sewage treatment must be inaugurated. The stock yards area constitutes the most difficult problem in the entire Chicago district if not in the country. Study of this problem was begun in 1911 when a testing station was established. Investigations were made of the discharge from each of the principal packing plants to find out its quantity, nature and variation from time to time. It was found that the sewage was about eight times as "strong" as domestic sewage. Various schemes of treatment were tried on an experimental scale, including the Imhoff tank method, sprinkling filters and the recently developed activated-sludge method. The latter was looked upon with much interest and extended experiments carried on. It depends on the property of the depositing sludge of oxygenizing and nitrifying the dissolved organic matter as air is blown through the sewage. Part of the sludge is used over and over again. The experiments were continued with various types of tanks, quantities of air and time of treatment. It was found that the process could be employed both in summer and winter, but was more efficient in summer.

As the result of these studies a plant was designed to consist of fine screens (20 to 30 mesh per inch), a grit chamber to remove grease, aeration and settling tanks besides sludge dryers, power house, etc. It was found that the sludge at the end of the process ran about 98.5% water, so that filter presses would be required to reduce this to about 75% water and form a cake. Further treatment of this material by dehydrating and finally grinding would convert it into a commercial fertilizer of a fair value depending on market prices, but offsetting a considerable part of the operating costs. The plant is proposed to have a capacity of handling about 50,000,000 gal. a day and would include the domestic sewage of the 60,000 employes as well as the industrial sewage of the district. The sewage will enter the plant through coarse bar screens followed by fine screens in the grit chamber, which should remove about 25% of the suspended matter. It will then pass through the grease-skimming tanks, from which it is expected that over 1000 lb. of grease should be collected daily. It then enters the aeration tanks where about 4 cu. ft. of air per gallon of sewage is blown through continuously for about eight hours, this being the active part of the process. From these tanks it passes into settling tanks where the sludge slowly settles. The effluent is clear and almost sparkling, entirely free from odor and stable in character. The tanks will be built of concrete.

For power equipment there will be needed a number of air compressors, pumps, filter presses, dryers and cranes, for all of which it is proposed to use electric motors. Assuming a power rate of 0.7 cent per kw-hr., the power cost for the year will be about $270,000. The labor cost is estimated at about $75,400, supplies and repairs $98,000, superintendence, etc., making the total operating $455,700 per year. Adding interest and depreciation, the total annual cost figures out about $822,000. The first cost of the

plant is estimated at about $3,750,000 on 1917 prices. Recoveries, depending upon the quantity and market price, should range from $192,000 to $462,000 annually, thus reducing the net operating cost in a very substantial degree.

At the present time this project, which was held up on account of the war, is being revived and its execution is delayed only by the negotiations between the Sanitary District and the stock yards interests as to the proportion of the initial and annual cost to be borne by each of these parties. Early agreement on this matter is anticipated so that the work may proceed. It is planned to erect the plant in unit sections so that the experience gained in operating on a large scale in some of the earlier sections may be used before deciding on the details for the remaining sections. The plant will be unique in being the largest one yet operated on the activated-sludge process and also in being the largest sewage-treating plant using electric power.

PROGRAM FOR CONVENTION OF ILLUMINATING ENGINEERING SOCIETY.

Papers Are Grouped so That Each Session Has Special Appeal to a Definite Division of the Lighting Profession.

It is the plan of the Papers Committee of the Illuminating Engineering Society to have each of the five sessions of the 1919 convention at Chicago, Oct. 20 to 23 inclusive, so arranged that all topics discussed at the session will have a bearing on some particular phase of the lighting industry. Monday afternoon's session will be devoted entirely to opening addresses and reports of committees; Tuesday morning's session to street lighting, searchlighting and photometry; Wednesday morning to glare, and industrial code symposium; Wednesday afternoon to papers of interest to commercial men, and Thursday morning session to papers on the design of interior illumination. Visits to the Chicago Electrical Trade Exposition and other entertainment features will occupy the time not taken up by covenant sessions and inspections.

The program as arranged by George H. Stickney, Harrison, N. J., chairman of the Papers Committee, is as follows: Presidential address, Dr. George A. Hoadley, Swarthmore, Pa.; report of Committee on Automobile Headlighting Specifications, Dr. C. H. Sharp, chairman, Electrical Testing Laboratories, New York City; report of Committee on Lighting Progress, F. E. Cady, chairman, National Lamp Works, Cleveland, Ohio; paper on "Lighting in England," by F. W. Willcox, British Thomson-Houston Co., London, England.

Paper on "Street Lighting with Low-Mounted Units, Kensico Dam Drive," by J. Howard Williams, former engineer New York Department of Water Supply, New York City, and C. A. B. Halvorson, engineer, General Electric Co., West Lynn, Mass.; "Recent Developments in Electric Street Lighting," by C. A. B. Halvorson, West Lynn, Mass.; "Recent Developments in Gas Street Lighting," by F. V. Westermaier, engineer, Welsbach Street Lighting Co., Philadelphia, Pa.; "Searchlights in the War," by Capt. Chester Lichtenberg, office of the chief of engineers, War Department, Washington, D. C.; "A Universal Photometric Integrator," by F. A. Bendford, illuminating engineering laboratory, General Electric Co., Schenectady, N. Y.; "Photoelectric Photometry," by Dr. A. H. Compton, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

"Glare," by Ward Harrison, illuminating engineer, National Lamp Works, Cleveland, Ohio; Symposium on Industrial Lighting Codes: (a) "Introduction," by L. B. Marks, consulting engineer, New York City; (b) "The Code in Wisconsin," by J. A. Hoeveler, electrical engineer, Wisconsin Industrial Commission, Madison, Wis.; (c) "The Code in New York," by J. H. Vogt, director of industrial hygiene, State Industrial Commission, New York City; (d) "The Code in New Jersey," by R. H. Leveridge, chief of Bureau of Electrical and Mechanical Equipment, Department of Labor, Trenton, N. J.; (e) "The Code in Pennsylvania," by J. S. Spicer, Department of Labor, Harrisburg, Pa.; (f) "Insurance Inspectors and the Code," by R. E. Simpson, engineer, Travelers Insurance Indemnity Co., Hartford, Conn.

"Opportunities for Extending Lighting Through New Applications," by R. M. Searle, vice-president, Rochester Railway & Light Co., Rochester, N. Y.; "Factory Lighting as a Central-Station Problem," by O. R. Hogue, head lighting agent, and J. J. Kirk, illuminating engineer, Commonwealth Edison Co., Chicago; "A Survey of Industrial Lighting in Fifteen States," by R. O. Eastman, of Fuller & Smith, Cleveland, Ohio.

"Artistic Illumination of Interiors Without Use of Pendent Ceiling Fixtures," by A. D. Curtis, president, and J. L. Stair, illuminating engineer, National X-Ray Reflector Co., Chicago; "Principles of Interior Illumination," by Bassett Jones, consulting engineer, New York City; "Co-efficients of Lighting Utilization," by Ward Harrison and E. A. Anderson, Cleveland, Ohio; "Tests of Lighting Units," by Van-Rensselaer Lansingh, engineer, Cincinnati, Ohio.

IRON AND STEEL ELECTRICAL ENGINEERS DISCUSS VITAL PROBLEMS.

Thirteenth Annual Convention Held in St. Louis Sept. 22-26 Brings Good Collection of Papers and Active Discussion.

A very successful convention was held by the Association of Iron and Steel Electrical Engineers at St. Louis, Mo., on Monday to Friday of this week. The program was somewhat ambitious in the number of subjects presented, but each of these received careful attention and many of the papers were actively discussed. The attendance was about 250, this being slightly under expectations but due somewhat to the disturbed conditions in the industry.

President Petty in his annual address outlined the work of the association during the past year, laying special emphasis on the work of the sections and committees of the association, particularly the Standardization Committee. There are now five sections at Birmingham, Chicago, Cleveland, Philadelphia and Pittsburgh, all of which are very active in the work for which they were organized. Mr. Petty referred to the satisfactory growth of the association from 28 members in 1907 to 1020 in 1917, and expressed the belief that at the end of the present year the membership would be 1200, as there had been a gain of 206 in the first eight months of 1919.

Space does not permit review of the papers and discussions, which will be presented in our next issue.

The newly elected officers for the ensuing year are:

President—B. W. Gilson, Youngstown, Ohio.

First vice-president—H. C. Cronk, Cleveland, Ohio.

Second vice-president—F. G. Wiley, Chicago, Ill.

Treasurer—James Farrington, Steubenville, Ohio.

Secretary—John F. Kelly, Pittsburgh, Pa.

Directors—R. F. Gale, Philadelphia, Pa.; J. E. Fries, Birmingham, Ala.; W. S. Hall, Chicago, Ill., and C. E. Bedell, Wheeling, W. Va.

RED CROSS TAKES UP FIRST AID AND ACCIDENT PREVENTION WORK.

American Red Cross Ready to Loan First-Aid Specialists to Utility and Industrial Companies.

It is stated that accidents cause 9.3% of the deaths in the United States. Part of these occur in industrial plants, and again part of these occur in electrical industrial plants. Looking at the situation from a humanitarian viewpoint and also from an economic standpoint it would seem that methods and systems should be devised and utilized to reduce the number of accidents to a minimum and to provide more ready medical means to relieve those who are injured.

With the latter as an object the American Red Cross has organized a first-aid division which employs a staff of field representatives trained in accident prevention and first-aid to the injured, the members of which are loaned, under virtually agreeable conditions, to factories, mills, mines, railroads, etc., for the purpose of instructing their employes in this important work.

SEATTLE SECTION A. I. E. E. CONVENES.

Annual Meeting and Dinner Devoted to Organization Problems of the Institute.

The annual meeting and dinner of the Seattle Section of American Institute of Electrical Engineers was held Sept. 16 at Hotel Butler. One of the principal features was the report of Chairman John Harisberger of his trip to Lake Placid, in attendance at the national convention of the Institute. He reported in detail on the work of the development committee, which he thought would be adopted by the board of directors.

On motion, the section proposed Dr. Magnusson as vice-president for the coming year of the Pacific Coast association, the recommendation having been wired to the convention which met in Los Angeles Sept. 18.

Much discussion followed relative to the report of the development committee. There was also discussion of the proposal of G. E. Quinan to have associate members transferred to higher grades. It was brought out by F. D. Nims that many associate members could not meet the qualifications required for higher rating. A committee was appointed to deal with this subject and report to the executive committee.

A. J. HIXON SPEAKS AT MEETING OF MASSACHUSETTS CONTRACTORS.

At a meeting of the Boston district of the Massachusetts State Association of Electrical Contractors and Dealers held Sept. 18 at Boston, A. J. Hixon, state committeeman of the national organization, was the principal speaker. He took up the formation of the national association and showed its progress step by step to the adoption of the Goodwin plan at New Orleans, and then explained in detail the resolutions adopted at the Milwaukee convention. He made the statement that that meeting was to the electrical industry what the Declaration of Independence was to the counry.

ELECTRICAL MANUFACTURERS SCHEDULE SECTION MEETINGS.

Many of the Sections to Meet in New York and Chicago On Oct. 14-16.

The Associated Manufacturers of Electrical Supplies will hold the following section meetings at its rooms, 30 East 42nd street, New York City: Oct. 14—Signalling Apparatus Section, Lamp Receptacle and Socket Section, Industrial Lighting Fixture Section, Snap Switch Section, and Attachment Plug Section. Oct. 15—Outlet Box Section, Fuse Section, Knife Switch Section, Insulating Materials Section, and a meeting of chairmen of Section Tariff Committees. Oct. 16—Panelboard and Switchboard Section, Moulded or Formed Insulation Section, Line Material Section, and Air Circuit Breaker Section. A meeting of the Heating Appliance Section will be held in Chicago, Oct. 14.

CHICAGO CONTRACTORS DISCUSS COST SYSTEMS AND HOUSE WIRING.

At a meeting of the Chicago district of the Illinois State Electrical Contractors' Association, held in Chicago, Sept. 19, A. R. Nordlie was elected chairman; F. L. Butler, vice-chairman; G. G. Pedley, secretary, and L. M. Kahn, treasurer. The feature of the meeting was a blackboard analysis and discussion of cost systems, with J. W. Collins at the blackboard. It was announced arrangements had been made with a Chicago bank whereby contractors completing house-wiring contracts could obtain full payments for their contracts at a discount of 6%, the bank to make the collections on the part-payment plan.

JOINT MEETING OF A. I. E. E. AND I. R. E. AT NEW YORK.

A joint meeting of the American Institute of Electrical Engineers and the Institute of Radio Engineers will be held in the auditorium of the Engineering Societies Building, 33 West 39th street, New York, on Oct. 1, at 8:15 p. m. The following papers will be presented: "Trans-Oceanic Radio Telegraphy," by E. F. W. Alexanderson, General Electric Co.; "Telephone Repeaters," by F. B. Jewett and B. Gherardi, Western Electric Co., and "Principles of Radio Transmission and Reception with Antenna and Coil Aerials," by J. H. Dellinger, Bureau of Standards.

CENTRAL STATION ESTABLISHES LIBRARY.

The Rochester (N. Y.) Railway & Light Co. is planning the establishment of a new library consisting of books, reports, etc., issued by engineering and technical societies, and pamphlets, publications and literature in general relating to electric and gas lighting, for the use of its employes. The library will be located in the offices of the company, 34 Clinton avenue, North, and will be in charge of a competent librarian.

Commercial Practice

Electro-Culture for Fruit — Value of the Electric Range as Central-Station Load — Advantage of Off-Peak Rates

EFFECT OF ULTRA-VIOLET RAYS UPON BANANAS, SUGAR CANE, ETC.

Experiments Indicate Increased Yield from Use of Ultra-Violet Rays.

Experiments carried on in Hawaii upon the effects of darkness, sunlight and quartz-lamp light upon bananas, pineapples and sugar cane have brought out some interesting facts, according to a recent issue of Louisiana Planter and Sugar Manufacturer.

Normal sugar-canes kept in the dark in Hawaii at 22° grew, but became pale; exposed to the light from a quartz-mercury lamp they turned green in 2½ hours, while sunlight had no effect. Of three other lots, one was grown under colored glass, the second in normal sunlight, the third exposed to sunlight and to the quartz-lamp light rays; the second gave 30% more sugar than the first, the third 8% more than the second, and therefore 38% more than the first. Pineapples exposed to the ultra-violet rays for 40 minutes every morning were found to give riper and superior fruit. The same effect was obtained with bananas; cut banana-leaves and stalks, moreover, kept fresh in water for two weeks, after having been radiated upon by the quartz-mercury lamp; without this treatment they faded in one week. Thus fruit might be preserved for export, but great care is required to secure the proper radiation treatment. Mention is made of experiments with arc-light carbons, impregnated with sodium tungstate, uranium nitrate, ammonium molybdate, and titanium chloride, for the production of ultra-violet rays.

VALUE OF ELECTRIC COOKING AS CENTRAL-STATION LOAD.

Striking Summary of Its Profitableness Presented by Pierce L. Miles Before Colorado Central-Station Men.

The advantages of electric cooking have frequently been presented and are fairly well known among progressive central-station men. Many of these are still far from being convinced as to its practicability and profitability as a central-station load, however. Of special interest, therefore, to such men should be a paper on "Electric Cookery" presented last week before the Glenwood Springs, Colo., convention of the Colorado Electric Light, Power and Railway Association by Pierre L. Miles, of the Edison Electric Appliance Co. His paper consisted almost entirely of the following terse statements summarizing his conclusions as to the electric range, cooking rates and range-modernizing methods, based on many years' experience and investigation among central-station men, who are today successfully exploiting the sale of electric ranges.

The Electric Range.

The electric range is the best cooking apparatus on the market. It will (a) boil, (b) fry, (c) roast, (d) bake, (e) broil, better than any fuel.

The initial cost of the range is not retarding the rapid introduction of electric cookery, as is sometimes claimed.

The cost of operating an electric range is purely a matter of educating your customers to the proper use of the range. All the cooking for a family of five may be done with 100 kw-hr. per month, and current in excess of this amount is unnecessary.

Electric range is *not* slow and if properly employed compares favorably with other fuels wherever speed is necessary.

Even though the heating of a large amount of water for bath purposes is not practical on an electric range, this will not be a deterrent to the sale of ranges if the subject is properly handled.

The fact that the electric range will not heat the kitchen in the winter months is an advantage rather than a disadvantage.

The electric range has more points of superiority (talking points) than has electric lighting.

The Rate for Electric Cooking Service.

There is more profit in the electric cooking load than in the lighting business.

Only 600 watts of station generating capacity is necessary to serve a 6000-watt range.

The electric range load is sometimes more profitable in a small town than in a large one.

With a 3-cent cooking rate and with fuel costs of 1 cent per kw-hr., lighting companies can afford to spend at least $100 in order to connect a range to their lines.

A 3-cent electric cooking rate can be justified against a 5-cent small-motor rate on the basis of being a more profitable load.

The electric range load should not bear the same expense of distributing current as does the present lighting load.

A 15-kv-a. transformer will serve a group of 20 ranges, having a connected load of 120 kw., because of the high diversity-factor.

The yearly revenue per kilowatt of generating capacity serving the electric range load is greater than that serving a small motor load.

The investment required to serve a range customer is not as great as originally required to serve a lighting customer.

There is more profit in selling 1500 kw-hr. per year at a profit of ½ cent per kw-hr. (your range load) than in a profit eight times as great per kw-hr. for the lighting load.

There is more profit in a 1½-cent water-heating rate than in a 3-cent cooking rate.

Two hundred electric ranges can be installed in

nearly every small town, without having to increase the present generating capacity.

Only 10 to 15% of the total connected range load will fall on present station peak.

The diversity-factor and load factor of the electric range load is far better than that of the lighting load.

ELECTRIC RANGE MERCHANDISING METHOD.

It is not necessary for a lighting company to make any investment for the selling or advertising of electric ranges.

With proper methods between 3 and 5% of residential customers may be sold an electric range during the first year of electric range sales work.

Advertising alone will not sell electric ranges.

A low rate for electric current will not in itself sell electric ranges.

A display and description of what the electric range is will not sell ranges.

Even a small-town company can employ an electric range salesman, as well as a range demonstrator, at no expense to itself.

The campaign on electric ranges should consist of two parts, educational and sales.

The cost of the inside wiring should be included in the selling price of the range.

Time payments are an esential part of a successful electric range business.

The manufacturer's system of discounts provides for compensating the central-station man for the cost of retailing.

If the lighting company does not engage in the water-heating business, it should be in a position to offer suggestions to its customers regarding the best method of doing this work, as well as that of heating the kitchen in the winter time.

The sale of an apartment-house installation offers one of the most profitable loads for the central station at the least sales expense.

Mr. Miles said in conclusion: The time is coming, and it is not so very far distant, when the central-station man responsible for sales will be called upon to show a yearly increase in kilowatt-hours delivered. The electric range load offers the golden opportunity to meet this demand.

Now is the time when farsighted men are breaking the ground for this future business. They are placing their quota for the coming year. They intend to jump in and by aggressive sales and advertising methods reach their goal. They have carefully considered the following two basic factors in this field of central-station activity.

First, is the electric range a satisfactory article to recommend to the public? Will the purchaser be compensated and fully satisfied with his investment?

Secondly, is a rate for cooking profitable to the central station? A comprehensive study of the question will reveal that it is.

Once these two points have been settled the sales manager must not allow any of the annoying details, incident to any new business, to swerve him from the purpose of building up this phase of his business.

Water heating, initial cost, installation expense, time payments, heating of the kitchen, costs of selling, maintenance, are some few of the problems which are bothering central-station men today. They are merely the details of the two basic facts. With earnest application they can and will be solved. But not by sitting back and hopelessly repeating "Electric ranges cannot be sold, because of this or that reason."

The building of the range load is hard—sometimes very hard. But it can be done. It takes both brains and live sales energy. It takes the pioneer quality of stick-to-it-iveness, which made a success of the telephone, the automobile, the electric light, and every other new device brought onto the market.

First, be sure you are right in the first two points. Then go ahead, assured of success in the knowledge that if your fundamentals are correct, all other questions and conditions are capable of being solved and overcome. Serious as they may sometimes appear to be, they are relatively unimportant, and require only serious application in order to find the way through, over, around, or under.

VALUE OF OFF-PEAK RATES IN IMPROVING LOAD-FACTOR.

President Elden of Association of Edison Illuminating Companies Recommends Greater Use of Off-Peak Service.

At the annual convention of the Association of Edison Illuminating Companies held at New London, Conn., Sept. 16-18, L. L. Elden, of Boston, in his presidential address had this to say on off-peak rates and service:

"Two years' experience in the application of an 'off-peak rate' for secondary service has clearly demonstrated the economic value of such a rate, if service is supplied under suitable restrictions. Broadly speaking, with a rate based upon supplying service only when available, it is usually possible to secure nearly 90% of a consumer's total business on a secondary rate without incurring an expenditure in excess of a small fraction of that required to supply his total service requirements. The effect of such business on the investment, income and operating accounts is obvious, increasing, as it does, the income, while reducing the average amount of capital required per kilowatt of capacity or consumer served, and further reducing the cost per kilowatt-hour delivered through improvement in load-factor."

DEVELOPING GOOD WILL THROUGH NEWSPAPER ADVERTISEMENTS.

Nebraska Power Co. Presents Some of Its Central-Station Problems for Consideration by the Public.

The Nebraska Power Co., of Omaha, Neb., is appealing to its customers through well written newspaper advertisements for careful consideration of the problems of the company. Facts are stated in a plain manner, with every appeal to the better business judgment of the customer and no appeal whatever to sympathy. In its "Talk to Our Customers No. 1" the company asks consideration of the load equivalent to 75,000 electric lamps being suddenly thrown upon the company on account of a thunderstorm which practically darkened the skies on the afternoon of Monday, April 21, 1919. If one person turned on the lights in his home, office or store, it is only probable that in a city the size of Omaha that thousands did the same. For that reason many thousand dollars' worth of machinery, with its attendant labor, fuel and other supplies, must be held continuously in reserve to care for storms which may occur only two or three times a year, so that when a consumer presses a switch, electric service will instantly be available.

Operating Practice

Suspension Insulator Failure—Reducing Converter Flash-Overs—Generating Switchgear—Substation Temperatures

PUNCTURE OF SUSPENSION INSULATORS.

From Paper on "Symposium of Operating Difficulties," Before Pacific Coast Section, A. I. E. E.

By Clem A. Copeland,

Technical Assistant, Bureau of Light and Power, Los Angeles.

The trouble dealt with here occurred on a 110,000-volt, 3-phase, 50-cycle line with neutral of transformers grounded at both ends, and two vertical circuits of 300,000-cir. mil., 19-strand copper cable, steel towers, 44.13 mi., with no branches, at a point 29 miles from San Francisquito Power Plant No. 1 on the summit of the Newhall Hills, at an altitude of 2350 ft. The weather was foggy and wet but calm. The temperature was about 55° F.

The single suspension middle crossarm string on the east circuit of 7 insulators failed by the 6 lower insulators puncturing between pin and cap forming a crater from ½ to ¾-in. in diameter, all craters being approximately in the same vertical plane at right angles to line direction on the leeward side of the string away from the tower. The tower is at a sharp vertical angle, therefore the strain is great. The six lower insulators which failed were manufactured in 1912, but were not put in service until February, 1917. The top insulator was made in 1915 and put in service in February, 1916.

The same tower on July 17, 1919, the top strings on the same circuit failed in a similar manner at 4:30 a. m. during a heavy wet fog. On April 1 and on July 19 the same trouble happened on single dead-end strain strings of two of the same kind of insulators on 33,000-volt lines of No. 2 solid wire in Los Angeles.

The cause of the trouble is obscure, but several theories have been advanced:

(a) Sharp ridged corrugation on pin form rings of high electrostatic density and strain.

(b) Unyielding cement between metal of one coefficient, in conjunction with

(c) Heavy strain due to vertical angles in line. ((c) does not seem to be borne out in the case of 33,000-volt lines.)

(d) Flat top of insulator under cap and flat top of pin cavity may be of a form to introduce shrinkage strains in cooling.

The remedy is implied in the above analysis of causes.

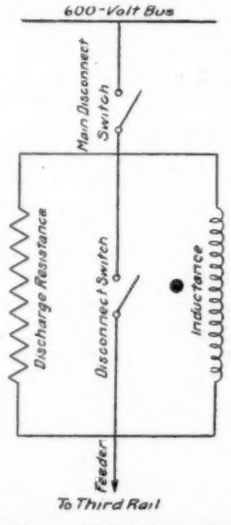
ARRANGEMENT OF FEEDER INDUCTANCE TO REDUCE CONVERTER FLASH-OVERS.

Selective Action Enables Feeder Breakers to Open Before Machine Breaker.

In a substation supplying 600-volt direct-current power to a railway terminal by about 6000-kw. in synchronous converters, considerable trouble was being caused on account of short circuits on the third rail in the terminal yard. Many of the feeders between station and third rail were of very short length and of large cross section, hence a short circuit on the third rail was almost equivalent to a short on the station 600-volt bus.

When two synchronous converters were operating and pulling a heavy load due to many of the feeders being well loaded, it often happened that one machine breaker would open, shifting the total load to the other machine which likewise immediately dropped its load. Another form of trouble was that when one machine was operating alone, as during the early morning and later evening hours, a short circuit in the terminal yard usually caused the machine breaker to open up.

The accompanying diagram shows the method proposed, by which nearly all such trouble as mentioned above would be eliminated. This diagram shows that an inductance has been inserted in the short feeder between substation and third rail. Reactance so located reduces the severity of the short circuit, thus preventing the machine and station bus from receiving as severe a jolt as they otherwise would.



Arrangement of Reactance and Discharge Resistance by Which Flash-Overs and Opening of Machine Breakers on Short Circuits Was Overcome.

Apart from the cushioning effect of the inductance, the time lag or time constant of the circuit or feeder enables the feeder breaker to open before the main or machine breaker has time to function. Such an arrangement therefore not only tends to reduce interruption of service that may follow the opening of a machine breaker but also reduces the likelihood of flashover of the synchronous converter when a heavy load suddenly ceases.

In the installation it will be noted that a disconnect switch has been installed so as to permit short-circuiting or eliminating the influence of the reactance during such times as more than one machine is in service.

This was done because it had been found that it was when one machine was on the bus alone that flash-overs and opening of the main breaker occurred. A discharge resistance is also inserted in parallel with the reactance to prevent piling up of voltage due to sudden current rush. The discharge resistance was made up of several sections of cast-iron railway grids. The reactance was composed of 400 ft. of 500,000 cir. mil, lead-covered cable. This length of cable was wound upon its reel, the reel being fastened in place. The cable was connected up in circuit through lugs, an arrangement that would permit removing the cable, undamaged, on short notice, should it be necessary to use this length of cable elsewhere.

CHOICE OF SWITCHGEAR FOR MEDIUM-SIZED GENERATING STATION.

Reasons for Choice of Truck Type Switches by Lycoming Edison Co. Are Given.

The Lycoming Edison Co., Williamsport, Pa., found it necessary to enlarge its generating capacity by installing two 6600-volt, 7500-kw., 3-phase generators and one 2500-kw., 2300-volt, 4-phase generator in a station designed for an ultimate capacity of 30,000 kw. These sources of power are interconnected by means of 6600-volt 3-phase and 2300-volt 4-phase transformers. In a paper read before the Pennsylvania Electric Association at Bedford Springs, Pa., recently, G. E. Wendle discussed the selection of switchgear for power plants of moderate size, his experience and remarks being based upon the installation of the above station.

As a necessary preliminary, the ultimate station capacity, the maximum size and voltage of generating unit, and the probable number of feeders were carefully estimated upon the operating data of the present equipment and the anticipated development of our tributary territory. The figures assumed for these several items were as follows: 30,000 kw.; 7500 to 10,000 kv-a., at 11,000 volts; and 16 3-phase and 10 single-phase feeders in addition to the present lines. These estimated additions actually provided for three times the present capacity and between four and five times the present output. The choice of switchboard and control was confined to three systems, namely, the usual panel type, consisting of a pipe framework which supported the various apparatus, etc., and on which was mounted the marble or slate panels with operating handles, instruments, etc.; the cell type with bench board control; and the safety enclosed removable truck type with remote control of all main or master trucks.

After a short study of the panel type, it was eliminated because of the large number of exposed high voltage parts, difficulty in meeting the present and anticipating the future requirements in the state safety code in the matter of isolation of dangerous parts.

The matter of selection was thus reduced to the cell and the safety enclosed truck types, and as these two types were available in units of ample size and were practically equal in cost for equal number and subdivision of units, the final choice was made after careful consideration of the relative merits of these types under local conditions in favor of the truck type.

The cell and the truck types of switches appeared to have about the same reliability, taking into consideration the investment warranted by revenue. Regarding safety the truck type was considered preferable, since it is absolutely safe. Facility of installation was entirely in favor of the truck type switch, while facility of inspection and maintenance between the two types is on a par with the former and in favor of the latter for maintenance. The truck type was thought to have somewhat the advantage as regards operating economy. Localization of faults and isolation of trouble seemed about the same with the switch in a cell and the one on a truck.

Tests were made to determine the time required to remove a truck type switch as follows with men of ordinary physique and average intelligence but without special drilling or experience in handling the trucks. The series of operations were as follows:

(a) Go to a designated faulty truck and remove that truck from its cell.
(b) Go to the spare truck, remove it from its usual cell, move it into proper position to enter the faulty truck's cell, and push the truck home.
(c) Close the oil switch, thereby locking the truck in place and resuming service.

The time required for the smaller feeder truck, 30 seconds; and for the main trucks, 1 minute 45 seconds. These tests indicated clearly the great advantage of the truck type when emergency conditions must be handled quickly and surely by men of average capacity.

For the same number and subdivision of generating and distributing units, the cell and truck types were estimated as approximately equal in cost. The cell type cost was definite as far as the apparatus and appliances, but there was a large estimated portion which was subject to considerable doubt because of the fluctuating labor and material costs and existing uncertainties. It was concluded that a cell type installation would certainly cost as much and probably would cost more than a truck type.

INFLUENCE OF SUB-BASEMENT SUBSTATION TEMPERATURES UPON MACHINE INSULATION.

Mica Insulation Advocated Where High Summer Temperatures Exist.

It is a fact long since appreciated by operating engineers that the ambient temperatures of sub-basement substations may be very high. This condition may exist the year round, but it is more marked during the summer months. In sub-basement substations 35 ft. below the sidewalk and containing two or more 2000-kw. synchronous converters or units of 4000-kw. it is a difficult matter to carry off the large heat losses and the temperature tends to be high regardless of practical precautions.

The loads on sub-basement substations is often such that the load-factor on individual machine is high, and this coupled with high operating temperatures results in shortened life of the insulation of machines so operated. In fact it has been the experience of several companies that the insulation of machines in sub-basement substations becomes cooked and frequent rewinding is necessary. In one recent case, a 2000-kw. synchronous converter had been subjected to heavy loads for long periods, with resulting high internal and ambient temperatures, with the result that it was necessary to re-insulate it about every fifteen months. The company in question aims to overcome this objection, not of cost alone, but loss of capacity also, by adopting mica insulation for machines that are to operate in their sub-basement substations.

Contracting-Construction

Contracts on Fee Basis, Developing Repair Service, Cost Accounting and Other Points on Squire Co. Organization

BUILDING UP A LARGE CONTRACTING AND REPAIR BUSINESS.

Progressive Methods Used by Kansas City Contractor to Establish Growing Institution.

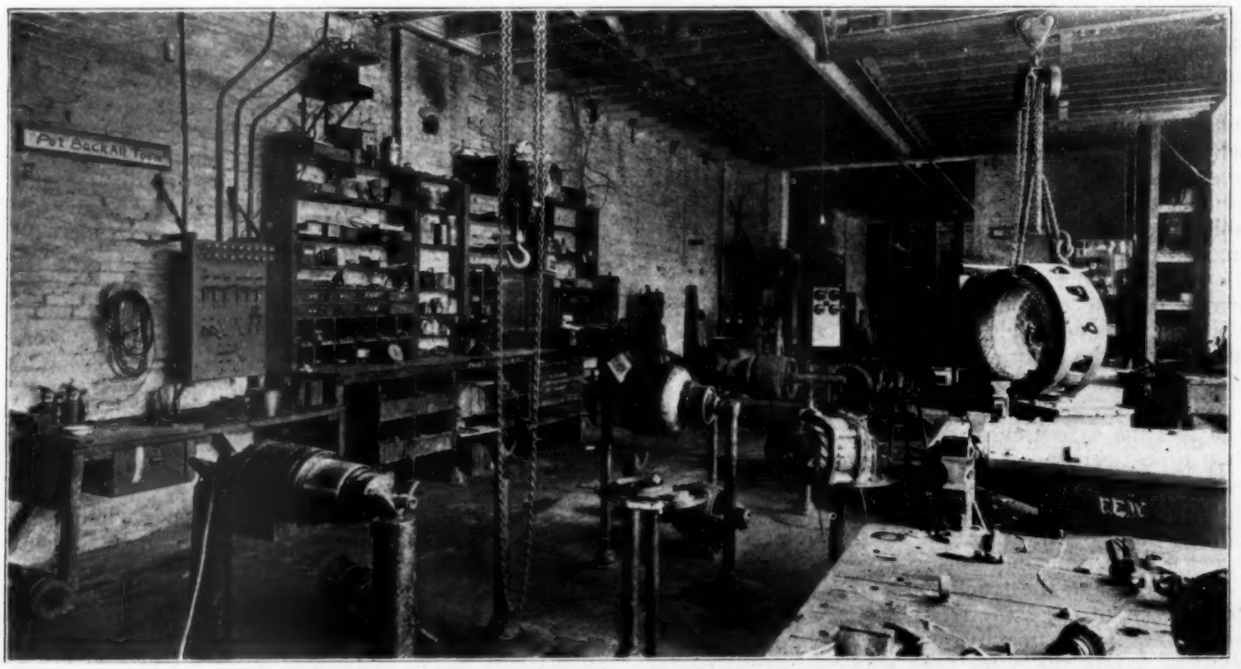
Developing co-ordinately a large construction and a large repair business has been the aim of the Squire Electric Co., of Kansas City, Mo. Some of the methods employed in building up the present volume of business may be interesting and helpful to other contractors and repair shop managers.

The plan of taking contracts on the basis of a flat bid for the engineering, the customer to pay all labor and material costs, has been used by the company to a great extent. "The letting of contracts on the engineering fee basis, which is cost plus a definite amount, puts the contractor on the same basis as the owner with reference to the job," said Mr. Squire, president of the company. "The owner sees clearly that it is to the interest of the contractor to shorten the time, the chief element of cost, as much as possible. Under this plan, the controversies over extras are avoided, since the contractor is not compelled to fight against elements that will reduce his profit. Our experience has been that owners work with far better co-operation with the contractor under this plan. And we, knowing closely what the overhead on a job should be, are sure we are going to get it."

An instance of the operation of this plan was the installation of conduits, wiring, converters, auxiliary motors and switchboard and like items, in the new plant of the Kansas City Light & Power Co. The plant was erected to meet an emergency; time was the chief factor. The company was willing to pay for overtime, and the Squire organization therefore worked under high pressure. Foremen and some workmen got in 81 hours a week, counting time and a half and double time on nights and Sundays. The extra time chargeable to overhead was absorbed by the reduction in the total time consumed on the job.

During the past summer the Squire Electric Co. has had 80 to 100 men on its payroll. The conduit, wiring and switchboard installation in the new Western Union Building in Kansas City, wiring and installation of motors for ice companies and mills, the half-million dollar job of the St. Joseph central station, and similar contracts in the past year or so have enabled the company to build up its large organization and hold it together.

The basis of the organization, however, developed during the war period when construction work was lacking, has been repair work. Having facilities and workmen, the company was able to extend valuable aid to electric railway companies in the repair of equipment, winding of armatures, rebuilding of generators and motors. The company has devised and built special machines, such as one for the making of coils of uneven legs, for the handling of such work. This service to electric railways was the more welcome, since many railway companies found it impossible to maintain their own shop organizations at the



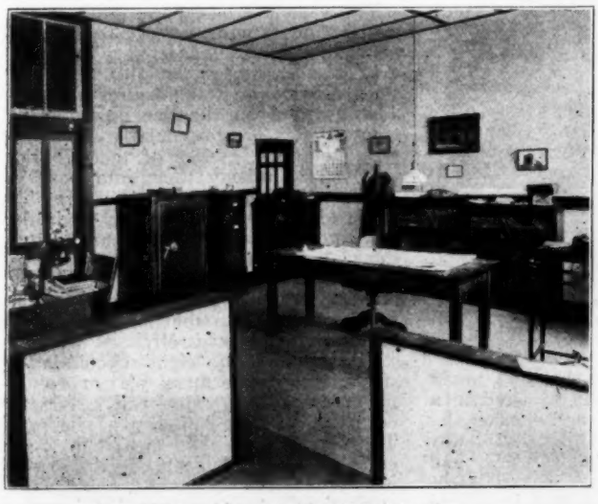
View of Squire Electric Co. Shop, Kansas City, Mo., Showing Longitudinal Overhead Hoist Track, in the Path of Which Are Set the Winding Racks. At the Left Is a Testing Rack of 5000-Volt Capacity.

desired level of efficiency. Many of the smaller electric railway shops lacked expert electrical mechanics; the expense of handling repair jobs in such plants was only less troublesome than the inability to get the work done properly.

The success of Mr. Squire in holding his organization together through those trying times is noteworthy. Several of his employes have been with him since he went into business ten years ago. A majority of his regular men have never worked in any other shops. This result surely has a reason; there are, in fact, two or three reasons. One is the fact that Mr. Squire has so painstakingly maintained a high standard of workmanship; this is appreciated by the better workmen, who take pride in their efforts and have a permanent satisfaction in knowing that the good work they do will not be disparaged by the poor work of a fellow employe. In a plant where high standards of product are maintained each workman is keyed to his best efforts, and in consequence his ideals are dominant; he is not led into complaints and dissatisfaction by handicaps to his professional advancement.

Another factor is the complete equipment of the plant. There are all the incidental as well as the principal items for facilitating work—overhead tracks, hoists, well built furnaces, drills, lathes, etc. The workman is not handicapped by the need of getting along with inferior tools of his trade. Encouragement has resulted in devising new methods and machinery for performing regular tasks, and these, in turn, have enabled the workmen to bring about a more satisfactory result on each job in hand.

A factor which operates less directly—though quite as surely—for maintaining the integrity of the organization is the cost accounting system, including the system of estimating and of figuring prices on supplies which has been developed. There is no guesswork as to the price at which stock should be

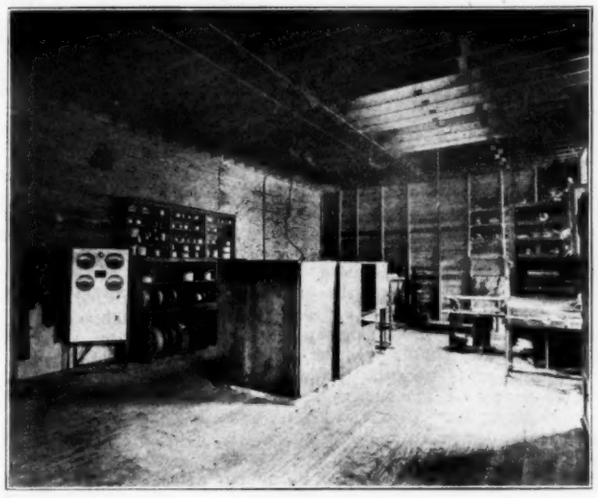


Office of the Squire Electric Co.

entered in a contract or estimated on a repair job: price lists are prepared in a simplified form which has proved so useful that many contractors have adopted it.

The effect of this certainty as to costs on the morale is more important than may sometimes be realized. There is an atmosphere of honesty and square dealing which the workmen are convinced extends to appreciation of their own services. Aside from their own judgment as to whether they are getting a square deal they feel a confidence in the fidelity of the employer. This confidence is, of course, augmented by the obvious confidence of the customer who seems to be turning his affairs over to the contractor, making the latter his full agent in the performance of the contract.

The large variety of work received is also an incentive to the electricians to remain with the com-



Electrical Oven and Coil-Winding Department, Squire Electric Co.

pany. The motors and generators received for repair and rebuilding range from the tiniest to the largest. The repair work on electric railway equipment has also been a factor in maintaining the organization. The work turned out has been similar to much work that heretofore has been done only at the plants of manufacturers. The employes realize, therefore, that they are getting the opportunity for advancement in expertness in their trade that they would get only at the big factories.

It may be said that the present large business is due directly to the ambition to serve when service was most needed. Mr. Squire built most energetically and patiently, when building was most difficult, during the war period. He evidently had taken to heart the appeal for unusual effort to keep the wheels of industry moving. Hundreds of electrical repair shops in the vicinity of Kansas City have been able to keep the motors in their communities operating because they could send the motors to the Squire shop and receive prompt service.

Incidentally, Mr. Squire has always been a leading member of the Kansas City and the state electrical contractors' associations, and has steadily passed along to other contractors ideas and methods that have been helpful to him.

PENNSYLVANIA ASSOCIATION OF CONTRACTORS AND DEALERS TO MEET.

The next quarterly meeting of the Pennsylvania State Association of Electrical Contractors and Dealers will be held in Scranton, Pa., Oct. 7, with headquarters at the Hotel Casey. The program includes business sessions, noon-day "Howdy" luncheon, entertainment, and banquet. An invitation is being extended to representatives from all branches of the industry to attend. M. G. Sellers, 1518 Sansom Street, Philadelphia, is secretary.

New Appliances

Volt-Ammeter—Armature-Winding Machine—Light Steel Transformer Case—Reel-Type Fixture—Motor Generator

Handy Direct-Current Volt-Ammeter for Railroad Signal Testing.

The electrically controlled and operated signal apparatus which is installed on modern railroads inevitably involves the employment of a considerable number of elements which must be maintained in proper adjustment and for each of which there must be an appropriate current source. In order that the correctness of adjustments and readiness of current supply may be properly determined, it is necessary to have accurate means of measuring resistances and electric currents and potentials. Electrical instruments having the required accuracy may be obtained from a variety of sources, but ones which combine with accuracy the ability to withstand the extremely rough handling which is encountered in this field and ones which combine in a reasonable bulk and weight the large number of different ranges which are likewise requisite are a different matter.

Roller-Smith Co., 233 Broadway, New York City, has developed a number of portable instruments for this work, of which what is known as the "Handy S. S." type volt-ammeter is a recently added instrument. It is especially suited for maintenance work. With the exception of one particular pattern including a 0-300 volt range, these instruments are self-contained; they are compact, to be put in the pocket or in a small tool kit, and meet in a satisfactory manner the needs of this service.

The mechanism is of the same D'Arsonval type as in the portable standard instrument made by the company, so that scale divisions are uniform and indications dead beat. The case is a brass stamping, or black enamel finish, and of waterproof construction. There is a wood plate on the bottom of the base for insulation purposes. Terminals take the form of appropriately numbered binding posts with nonremovable tops. Each instrument has a convenient zero adjuster. A leather carrying case can be furnished if desired.

These instruments are made with two or three current and voltage ranges each. Current ranges from 0-0.03 up to 0-30 amperes are obtainable and voltage ranges from 0-1.5 up to 0-300 volts. Six ranges is the largest in a single instrument.

New Style Chapman Adjustable Armature-Winding Machine.

The P. E. Chapman Electrical Works, St. Louis, Mo., announces a much more complete model of the Chapman adjustable bipolar drum armature-winding machine, in style 3 as shown herewith. This model, in addition to being adjustable in a few minutes for any style and size of random wound bipolar drum armatures and any size of wire from No. 20 to No. 36, has some special features enabling it to wind a very great amount of wire into armature slots without pounding the wire, and also has some unique lead forming and handling features reducing the labor on this part of armature winding.

Driving motor, controller, turn counter and other necessary parts are all integral parts of the machine, in fact, the machine is complete in itself.

A new automatic dynamometer-controlled reel holder and tension device has been perfected, which it is claimed stops all spool troubles and enables quick starting, high speed, great tension and quick stops, so that only about five seconds are required to wind in a coil. This reel holder and tension device is simultaneously adjusted for any sizes of wire by a simple crank, and once adjusted needs no further attention until the reel is empty. It is said that the announcement of this device has been held back long enough to prove the machine a success in actual practice. In one case an output of nearly 600 per day was obtained where the estimate was 200 to 250. It is claimed that the output of the machine runs into hundreds of armatures per day on many sizes and kinds of armatures; that the saving over hand winding is usually anywhere from 10 up to 30 to 1 or even better. It is claimed that the machine is easy to operate, well and strongly built; that it is useful both in the job shop and in the factory. The machine is also useful for winding field coils, smaller armature coils, etc.

Chapman Style 3 Armature and Field-Coil Winding Machine.

Steel-Clad Transformers—An Important Development in Transformer-Case Construction.

Announcement is made of an improved line of distribution transformers, the chief advantage claimed being a reduction in weight of over one-third by the substitution of a welded sheet-steel case for one of cast iron.

This new line is designed as the steel-clad type S transformer and is manufactured by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. No change has been made in the coil construction and insulation of the type S design, which has been on the market for many years, but an improvement has been effected in the tank construction which is the result of seven years' experimentation and development and it is claimed that a construction has been achieved which combines the light weight desired with the requisite degree of strength and rigidity and, furthermore, includes a treatment and finish of the tank surface which renders it thoroughly weatherproof.

The ease and cheapness with which distribution transformers can be shipped, handled and installed, is to a large degree a question of weight. Further, since distribution transformers are usually mounted on the line poles, heavy transformers are particularly objectionable, not only because of the difficulty involved in raising them into position for hanger-iron mounting, but also because of the strain that is put upon the pole and crossarms. The distance from the center of gravity of the transformer to the center of the pole is a matter of almost as much importance from the point of strain on the pole and crossarms as the weight itself.

The reduction in weight effected in the steel-clad transformers permits of mounting larger transformers directly on poles without building a platform. The new 10, 15 and 50-kv-a. transformers are about the same weight as the old 5, 7½ and 25-kv-a. transformers, respectively, which shows that between these limits of capacity with the same strength of support the transformer capacity can be doubled with the new line of transformers.

Desirability of reducing the weight of the transformer suggested the use of the sheet-metal cases and end frames, but while the advantages of such a construction were apparent, it is claimed that it has been adopted only after very thorough tests have demonstrated its suitability.

The material selected for the manufacture of the tanks, covers, and end

frames of the steel-clad type S transformers is a special grade of sheet-steel particularly adopted to the conditions of manufacture and service. It can be readily drawn, and in addition it has inherent rust-resisting qualities. This, combined with an extremely good finish, is claimed to have resulted in the production of a tank which is permanently weatherproof.

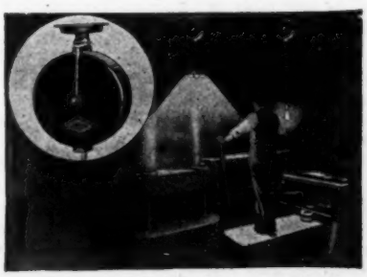
Weatherproofing of the steel-clad type S transformer cases consists of the following operation: (1) Sandblasting to remove the scale and dirt and to roughen the surface; (2) applying and baking on a coat of priming paint; (3) applying and baking on a finishing paint. The priming coat is a special grade of paint which it is claimed, when applied to clean metal, forms one of the most effective coatings known for its preservation. The finishing coat is heavy in oil and is designed to withstand the wear of the elements. Its function is to protect the first coat which is adjacent to the metal and which gives the real protection to the tank surface.

The color of the finishing coat is a battleship gray, giving a smooth attractive finish. This pleasing gray color from the standpoint of civic pride is an improvement, it is claimed, over the former black that has hitherto been used for distribution transformers and has contributed to the unsightly appearance of streets and alleys.

A complete steel-clad transformer case is made from five different parts. The rim and base of the tank are drawn and cut from a single piece of sheet steel. The tank wall is formed from two sides which are drawn and welded and the rim and base are welded to the tank wall. Thus, four parts complete the tank and one part the cover. Much heavy equipment in the way of shears, braces, molds and dies is employed in the manufacture of the case. It is claimed that no expense has been spared to secure a transformer tank which is satisfactory, even to the smallest detail, and the manufacturers claim that the steel-clad type S transformer represents the last word in modern distribution transformer construction.

Anderson Reel-Type Extension Fixtures.

Occasions frequently arise in machine shops, erecting shops, assembling plants, garages, etc., where light is needed locally to permit examining the inside of some machine or casting, or the underside thereof. A new type of fixture has been developed to supply this need.



Anderson Reelite Fixture in Use in a Machine Shop.

The Anderson "Reelite" consists of a reel unit carrying approved portable reinforced cord. The cord-winder is of the four-spring type insuring long life even under severe usage. The base of the device is designed to attach to any 4-in. outlet box, or direct to the ceiling. To operate it is necessary merely to raise or lower like an ordinary window-shade.

This "Reelite" fixture is made in two types: The drop-cord type, with 12 ft. of cord and a 660-watt key socket, for

Anderson Reelite Fixture—A Hand Portable Trouble or Inspection Lamp—Can Be Used in Place of the Key Socket.

use in machine shops, providing flexible lighting to a degree impossible with ordinary local lighting fixtures; the portable type, with 25 ft. of cord and a hand portable, making it invaluable in garages, erecting shops and the like. It is said the outfit saves its cost even in a few months as with the Reelite only the actual length of cord required is unreeled so that it does not lie on the floor subject to the abuse ordinary portables receive. A suitable reflector can be attached to the socket to prevent glare from the lamp.

These fixtures are made by the Anderson Electric Specialty Co., 118-24 South Clinton street, Chicago.

Motor-Generator Set for Electric Meter Testing.

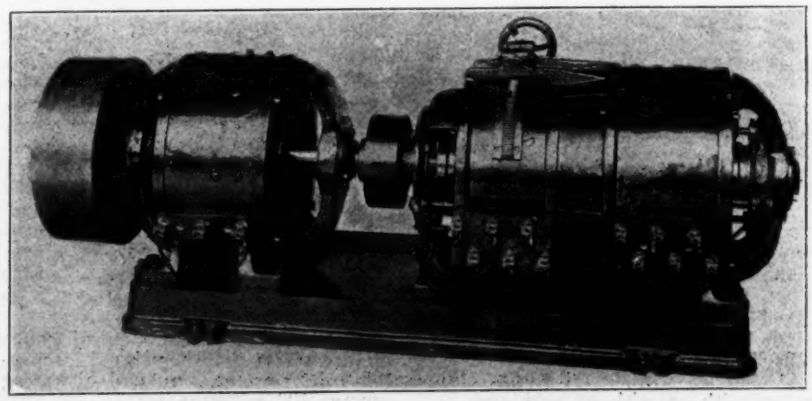
The three-unit motor-generator set illustrated herewith is manufactured by Roth Brothers & Co., 1400 West Adams street, Chicago, Ill., for use in meter-testing laboratories and for other alternating-current testing. This set consists of a direct-current motor driving two alternating-current generators. The motor has a speed range of 1750 to 1850 rpm., and is provided with a special wide-range finely divided field rheostat to obtain very close speed regulation. The use of ball bearings throughout in connection with the heavy flywheel insures steady speed, despite fluctuations in the supply voltage. Each of the two generators is of the four-pole, four-ring type, giving single-phase and three-phase current at 60 cycles.

The larger generator has a stationary field frame, and is wound to furnish current at any voltage between 110 volts and 240 volts, the special field rheostats provided giving this voltage range with a large number of steps. This generator is rated 7½ kva., 240 volts, 1800 rpm., 60 cycles. The smaller generators, that is the one next the motor, is provided with a movable field frame that may be rotated through a distance of 180 electrical degrees to either side of the center position relative to the position of the field poles of the larger generator. This adjustment is made by means of a wormgear operated by the handwheel shown. This smaller generator is rated 24 to 28 volts, 80 amperes, and it is furnished with a separate, noninductive loading resistance with 12 switches by means of which the current output can be varied by fine increments from 1/20 ampere to 85.9 amperes. This generator is also provided with a concentric type, finely divided field rheostat.

In testing meters, either single-phase or three-phase, current is supplied to the voltage coils of the meter from the larger generator, while the current coils of the meter are supplied from the smaller generator. Then the wormgear handwheel is operated to give any desired phase relation between the voltage and the current; in this way a load of any power-factor may be simulated.

In designing this set, certain limitations were observed, based on the latest standardization rules of the American Institute of Electrical Engineers. The wave shape of either generator at full noninductive load may vary from the sinusoidal by not more than 5%. The full-load efficiencies are as follows: motor 87%; each generator 80%. The generator field windings are excited from 230 volts direct current, and are tested at 1500 volts alternating current. The motor and the armature of the larger generator are tested at 1500 volts alternating current and the armature of the smaller generator at 1100 volts alternating current.

This type of set has so far been developed in only one size, which has proven satisfactory in two important laboratories where it is used for other purposes besides meter testing.



Roth Three-Unit Motor-Generator Set for Meter Testing and Other Similar Service.

Lately Approved Appliances

Underwriters' Laboratories, established and maintained by the National Board of Fire Underwriters (for service—not profit), have examined, tested and listed these electrical appliances in accordance with the Laboratories' Code for Construction and Test of Electrical Appliances. Copies of complete lists of standard appliances may be obtained from local inspection departments or from offices of the Laboratories in the principal cities.

Attachment Plug, Fuseless.—The Yost Electric Manufacturing Co., Toledo, Ohio.

"Lockfast" nonseparable attachment plug, 660 watts, 250 volts.

Listed July 21, 1919.

Cabinet and Cutout Boxes, Sheet-Metal.—Sprague Electric Works of General Electric Co., 527-531 West 34th street, New York, N. Y.

Listed July 8, 1919.

Circuit-Breakers — The Automatic Reclosing Circuit Breaker Co., Columbus, Ohio.

Single-pole automatic circuit-breakers for protection of low-potential circuits and arranged for automatic reclosing of circuit under certain conditions. All capacities 600 volts or less. Types ARL, CRL, DRL, LRL.

Listed Aug. 6, 1919.

Conduit Boxes.—The Adapti Manufacturing Co., 919-25 West street, Cleveland, Ohio.

"Adapti." Pressed-steel and cast-iron conduit fittings for use in concrete construction, Catalog Nos. 2CO, 3CO.

Box extension, Catalogs Nos. 498 and 499.

For use with flexible tubing, with or without clamps. Catalog No. 0260.

Covers, Catalog Nos. 17-19 inclusive, 25, 46-49 incl., 86-89 incl.

Also above with steel or porcelain covers, with or without bushings.

Listed July 31, 1919.

Conduit Boxes.—The Adapti Manufacturing Co., 919-25 West street, Cleveland, Ohio.

"Adapti." Cast-iron conduit fittings for use as outlet and junction boxes. Types 7113-15 inclusive, 7223-25 incl., 7263-65 incl., 7333-35 incl., 7273-75 incl., 7443-45 incl., 32170, 33170, 34170, 53202-292 incl., 53303-393 incl., 53404-494 incl., 53505-595 incl., 53606-696 incl., 72373-75 incl., 72383-85 incl., 73393-95 incl., 74493-95 incl., 541010, 542020, 542121, 543030-3232 incl., 544040-4343 incl., 545050-5454 incl., 546060-6565 incl., 547070-7676 incl., 548080-8787 incl., 549090-9898 incl.

Also above with steel or porcelain covers, with or without bushings.

Listed Aug. 1, 1919.

Conduit Boxes.—Electrical Fittings Co., Ltd., 331 King street, West, Toronto, Ont.

Pressed-steel conduit boxes and cast-iron conduit fittings.

"Diamond B" boxes.

Catalog No. 6359D.

"Diamond R" conduit fittings, Types DF, HA, LBA, LBV, LF, PL, PT, PM, PMC, PML, PMT, S, SC, TB, TL, TR, V, VA, VC, VH, VHA, VHC, VHL, VHT, VL, VT, W, WC, WL, WT.

Also above with metal or porcelain covers with or without bushings.

Listed Aug. 6, 1919.

Conduit Boxes.—The Pratt Chuck Co., Frankfort, N. Y.

Pressed-steel conduit boxes, Types AA, BBA, DAO, WA, YA, ZA, 100 and telephone box. Also above types with steel covers or covers with smooth, well-rounded outlets for flexible cords.

Listed July 18, 1919.

Conduit Boxes.—The Toledo Metal Products Co., 956 Spitzer building, Toledo, Ohio.

"B-G." Pressed-steel conduit boxes for use with steel conduit:

Catalog Nos. 900-0, 901-0, 906-0.

For use with flexible tubing and steel conduit, Catalog Nos. 902-R, 902-RW, 903-R, 903-RW.

Above provided with depression to admit of special fixture stud, Catalog No. 1001, which may or may not be used.

Covers, Catalog Nos. 800-807 incl., and brass covers, Catalog Nos. 800-B-807-B incl.

Listed Aug. 9, 1919.

Conduit Boxes, Service-Entrance.—Electrical Fittings Co., Ltd., 331 King street, West, Toronto, Ont.

"Diamond-B." Cast-iron service-entrance fittings with porcelain bushings. Types F, FE.

Listed Aug. 6, 1919.

Current Taps.—The Bryant Electric Co., Bridgeport, Conn.

"Bryant" or "Perkins." Multiple type.

Keyless, 660 watts, 250 volts, Catalog No. 102.

Listed July 2, 1919.

Current Taps.—Harvey Hubbell, Inc., Bridgeport, Conn.

"Hubbell." Multiple type.

Pull, 250 watts, 250 volts, Catalog No. 3190.

Listed July 10, 1919.

Electromechanical Gongs.—Stanley & Patterson, 23 Murray street, New York, N. Y.

"Faraday" electromechanical gongs for fire-alarm or other signal circuits, 125 volts or less. Normal operating current 100 milliamperes.

Listed April 9, 1919.

Fixtures.—The Cohen Co., Inc., 9-17 East Broad street, Richmond, Va.

Listed June 28, 1919.

Fixtures—W. F. Mahoney, 523 East Main street, Richmond, Va.

Listed June 28, 1919.

Fixtures, Show-Window.—Pittsburgh Reflector & Illuminating Co., 3117 Penn avenue, Pittsburgh, Pa.

Listed June 24, 1919.

Fixture Fittings. — George Cutter Co., South Bend, Ind.

Holder sockets and receptacles for "Sol-Lux" and other standard heel-reflector fixtures.

Medium base, porcelain shell, keyless, "Cutter." Catalog Nos. 30684-85, 30693-94.

Mogul base, porcelain shell, keyless, "Cutter," Catalog Nos. 30772-73, 30980-81.

Listed May 13, 1919.

Fuses, Cartridge.—Commercial Enclosed Fuse Co., 1317 Willow avenue, Hoboken, N. J.

Cartridge enclosed fuses, 0-600 amperes, 600 volts.

Listed May 21, 1919.

Lamp Adapters.—Pass & Seymour, Inc., Solvay, N. Y.

"P. & S." Medium to candelabra, 75 watts, 125 volts, Catalog No. 1262.

Listed April 29, 1919.

Lamp Guards. — Flexible Steel Lacing Co., 522 South Clinton street, Chicago, Ill.

Portable split wooden handle for "Flexco" or "Flexco-Lok" lamp guards. "Flexco Split Handle."

Listed May 14, 1919.

Motion-Picture Machine, Miniature.—The Pathescope Co. of American, 33-35 West 42nd street, New York, N. Y.

Portable miniature motion-picture machine, with incandescent lamp for illuminating element, 4.75 amperes, 110-120 volts.

For use only with slow-burning film supplied by manufacturer.

Listed May 21, 1919.

Outlet Plates.—Cameron Overbagh & Co., 231 North Wells street, Chicago, Ill.

Catalog Nos. 401, 403.

Listed June 24, 1919.

Panelboards. — Large-Dail Manufacturing Co., 114 North 13th street, Philadelphia, Pa.

Consisting of assembly of busbars, with or without standard cutout parts, of with or without standard switches mounted on insulating bases. Designed for use on low-potential circuits.

Listed June 23, 1919.

Trade Activities

Worthington Pump Acquires Epping-Carpenter Interests —Westinghouse Exhibits—Signal Electric Organized

S. V. George, electrical contractor-dealer, 8416 18th avenue, Brooklyn, N. Y., after an absence of a year and a half in Government service, has resumed business at the above address. In addition to general electrical work Mr. George will handle electrical household appliances and also repair appliances.

Ivanhoe-Regent Works of General Electric Co., Cleveland, Ohio, is sending out to the trade, a new discount sheet (Form 299). The discounts shown apply on Ivanhoe metal reflectors and fittings (Schedule R) and Anderson self-adjusting arms (Schedule T). The discounts on Schedule R are effective Sept. 5, and those on Schedule T effective Aug. 15.

Western Electric Co., New York City, according to official advices from Denmark, has received orders for two automatic telephone exchanges from the Copenhagen Telephone Co. It is stated that this will be the first introduction of an American telephone system into northern Europe, where Germany and Sweden formerly enjoyed a monopoly in this trade.

Jeffrey Manufacturing Co., Columbus, Ohio, manufacturer of coal-mining machinery, electric locomotives, etc., is sending out Bulletin No. 270 comprising eight pages. It is well illustrated and is descriptive of ventilating fans, giving tables of dimensions and capacities. Particular emphasis is placed on the subject of mine ventilation, one of the most important considerations in mining.

Worthington Pump & Machinery Corp., 115 Broadway, New York City, has purchased the plant and other assets of the Epping-Carpenter Pump Co., Pittsburgh, Pa., and will operate it as the Epping-Carpenter Works. Orders and contracts now on hand will be completed, and the regular business of the company continued. All correspondence should be addressed to the Worthington Pump & Machinery Corp. at the Epping-Carpenter Works, 10 43rd street, Pittsburgh.

General Electric Co. has sold to the White River Lumber Co., Enumclaw, Wash., a 2000-kw. turbogenerator and other equipment for installation in the latter's lumber mill, which is being rebuilt in accordance with plans requiring complete electrification. Another lumber mill order placed with the General Electric Co., recently, was for two turbogenerators of 750-kw. each and one of 1500-kw. for installation at the mill of the Unalaska Lumber Co., at Unalaska, Wash., in the vicinity of Napavine. The plant is being rebuilt for electric drive, which will require 3000 hp. in motors.

The McCord Manufacturing Co., Detroit, Mich., has published a catalog completely describing and giving the specifications for all the various copper-asbestos gaskets which it manufactures. Included are spark plug gaskets, exhaust and flange type gaskets, exhaust manifold gaskets, cylinder head gaskets for passenger cars, cylinder head gaskets for trucks, valve plate gaskets and Ford gaskets. An assortment of shim stock is also shown as well as miscellaneous gaskets of open and closed types.

Electric Furnace Construction Co., Philadelphia, Pa., has received from the Vancouver Engineering Works, Ltd., Vancouver, B. C., an order for a "Greaves-Etchells" furnace. The Vancouver company made an extensive investigation of the various types of electric furnaces and after a visit to the U. S. Navy Yard at Puget Sound, where a six-ton "Greaves-Etchells" furnace is in operation, made its decision in favor of that type of furnace.

McGill Manufacturing Co., Valparaiso, Ind., announces the purchase of the Despard & Gordon Co., Chicago, manufacturer of the "Levolier" pull-chain socket and other electrical wiring devices. The two companies will be merged into one organization whose personnel will be composed of the following: J. H. McGill, president; V. R. Despard, vice-president, and H. W. Harrold, secretary-treasurer. The main sales office and factory will be located at Valparaiso, Ind. Plans for increasing production are already under way, as it is stated that orders are coming in far in excess of its present output.

The Milliken Brothers Manufacturing Co., Inc., Woolworth Building, New York, has published a new catalog (No. 10) descriptive of Milliken buildings. Structures of this type are built under the Standardized Truss Unit System, designed by the company. It makes use of a small, interchangeable, standardized structural steel unit, and the buildings are all-steel, permanent and fireproof; they are furnished complete with sash, doors, skylights, etc. These buildings are suitable for all classes of industrial and manufacturing structures, plantation buildings, warehouses, etc. The system makes possible low transportation and erection costs, allowing the choice of a thousand buildings, all constructed under the same unit type. The catalog is 8½x11 ins. and profusely illustrated with buildings of this character erected for the United States Government and other important interests. Space is also given to the transmission towers, radio towers and special poles built by the company. A companion book of like size, known as catalog No. 11, has been issued as an erection handbook; this forms a complete guide to the construction of any Milliken building from foundation to roof. Copies of these catalogs may be obtained free from the company by those interested.

Interstate Electric Co., New Orleans, La., reports that it will establish a branch in Shreveport which it claims will represent the largest jobbing house of its kind in the South, exclusive of New Orleans. A stock of automobile and electrical accessories valued at $200,000 will be carried at the Shreveport branch. The firm will supply the accessory trade of north Louisiana, half of Texas, southern Oklahoma and Arkansas.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., in addition to other dealer's helps, has prepared for use in connection with the national advertising on the C-H 70-50 switch, two new four-color display cards. One shows an electric iron and cord with a young woman in the act of pushing the switch "on." The other carries a striking illustration of a toaster and cord equipped with one of the switches as part of a typical breakfast setting. Each has a prominent legend stating that "the buttons tell when the current is on or off." When used solely for street car advertising, these cards are imprinted with the dealer's name and address, and whenever they are desired for use as window or wall display cards, a suitable legend is imprinted in the space provided for the dealer's name and address.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is planning for the comfort of its 20,000 employes a modern cafeteria and restaurant, seating over three thousand persons and providing well prepared food on a "service at cost" basis. The three-story, buff brick building that will house the new eating place is already under construction. The first and second floors, seating 2500 people, will be devoted solely to cafeteria service while the third floor will have a modern table service restaurant, as well as the kitchens and an auditorium seating over 1000, which will be used for meetings of the various organizations and committees. Only the most modern conveniences of culinary art will be employed. The cafeteria counters will have moving belts to carry the trays of food placed on them, allowing the passing diner to have his hands free to select food. A huge refrigerating plant on the first floor will not only cool all foodstuffs in the refrigerators, but will also provide cold drink-

ing water at the numerous fountains scattered through the cafeterias as well as manufacture ice and make the frozen dainties appearing on the menu. Work on the new structure is progressing rapidly under the direction of Bernard H. Prack, the architect in charge of the job, and it is expected the new restaurant will be opened by the first of the year.

Pittsburgh Transformer Co., Pittsburgh, Pa., is distributing a 23-page bulletin (No. 2000) devoted exclusively to excellent views of installations of Pittsburgh transformers, many of which are operating on the largest and best managed transmission systems in the United States, others are in large steel mills and industrial plants. The development of the Pittsburgh mill-type transformer has resulted in one of the strongest mechanical structures yet produced, and together with the high efficiency inherent in these transformers, the great mechanical strength of the Pittsburgh mill-type transformer has given them the prominent position they occupy today.

Edison Electric Appliance Co., Inc., Hotpoint Division, 5660 West Taylor street, Chicago, is sending to its customers its first Fall Hotpoint broadside, in which are reproduced two of its October advertisements on Hotpoint appliances, appearing in the *Ladies' Home Journal* and *Saturday Evening Post.* These are very attractive advertisements and are certain to increase the already marked demand for these electrical appliances. Included in this broadside is a letter which will acquaint dealers with the critical situation in which the company finds itself in an effort to meet the unusual demand for its products. In many instances the company has trebled its output and has made every possible plan to take care of its Fall and Holiday trade. It is strongly urged that dealers of Hotpoint appliances anticipate their requirements and place their orders sufficiently in advance to enable the company to produce the goods in time for early delivery.

Signal Electric Manufacturing Co., Menominee, Mich., with a capitalization of $150,000, has been incorporated to take over the Menominee interests of the Tideman Electric Manufacturing Co. Henry Tideman, president of the Tideman organization, will devote his attention to the Cairo works, which the company just recently completed. His sons, Harold and William Tideman, in association with Fred A. Roper, Charles D. Hammond and George Fussner have organized the Signal Electric Manufacturing Co. as a separate enterprise and will continue operation of the plant at Menominee. Included in the products of the new organization are electric fans, blowers, and other industrial and domestic appliances and devices. Ralph W. Wells is president of the company; John E. Henes, Jr., vice-president, and Charles E. Hammond, secretary and treasurer.

Robbins & Myers Co., manufacturer of electric motors, generators and fans, Springfield, Ohio, has inaugurated operations in its new branch factory at Xenia, Ohio. The new plant consists of buildings leased from the Aetna Explosives Co., and constitutes a highly desirable location for the plant. It is under the supervision of L. W. McIntire, formerly assistant superintendent of Plant One. The first work at the Xenia plant will consist of alternating current stator winding, and will take care of only the production which cannot be obtained at the Springfield factories. The leasing of these quarters has been necessitated by the fact that it proved impossible to obtain sufficient female help at the Springfield plants to take care of the rapidly expanding business and the constant need for greater production. The company will begin construction shortly on its new office building at Springfield. An extension of the switch track to the Robbins & Myers property is now being built, preparatory to transporting materials for the building.

Bussman Manufacturing Co., St. Louis, Mo.,' has issued the second edition of the valuable booklet called "Fuse-ology." This is a 24-page pubication of which ten pages are devoted to valuable information in regard to what fuses are used for, how they operate, where they should be used and similar information that electricians and electrical men in general often do not know too much about. There is no doubt but that a great deal of misinformation exists in the minds of electrical men respecting the matter of fuses, and this booklet is of special value in pointing out features that every electrical man should know regarding the use of fuses. For instance, there is a discussion of exactly what takes place when a fuse blows, a similar one on the danger and expense of using fuses of unreliable type. Suggestions are made as to when it becomes desirable to use renewable fuses, and finally, information is given on the much disputed subject of fuse protection for motors. The remainder of the booklet is devoted to data, descriptions and illustrations of the company's renewable and non-renewable cartridge fuses.

Westinghouse Exhibits at Important Conventions.—One of the very interesting features at the Inter-Allied Foundrymen's Congress and Exhibit to be held at Philadelphia, Sept. 29 to Oct. 3, will be the splendid exhibit of electrical apparatus of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. This will include the latest scientific development in the art of arc welding, which relates directly to the foundrymen's business. The arc welding equipment consists of one 500 amp. arc welding motor generator set and is made up of three-phase, 440-volt, 60-cycle Westinghouse type "CS" motor mounted on a common shaft and bedplate with a 500-amp., 60-volt arc welding generator, which is large enough to supply energy for several electrode welding circuits if no carbon electrode welding is performed. The accessories exhibited consist of operator's hood and shield, graphite electrode holder, metal electrode holder and an adapter for equipping the metal electrode holder for light graphite electrode welding. A feature of the graphite electrode holder is its ability to remain in continuous service for long periods of time without heating up to a degree uncomfortable to the operator. The exhibit further includes electrically heated metal pattern plates on molding machines, which provide one of the most convenient, up-to-date methods of heating; also standard a. c. and d. c. industrial motors, starters and controllers, outdoor fuse boxes, type A and C knife switches, oil and carbon break circuit-breakers, Frankel connectors, standard line of meters, stationary and oscillating fans, bayonet immersion heater, glue pots, solder pots, steel clad heater, type C, oven heater, rectangular electric stove, electric range, domestic heating devices.

The Westinghouse Company will exhibit at the congress of the National Safety Council to be held in Gray's Armory, Cleveland, Ohio, Sept. 29 to Oct. 4, safety devices or models designed by men of that company for use in the various departments of the Westinghouse works where over 30,000 men and women are regularly employed. The exhibit includes such items as rip and crosscut saw guards, punch press guards, safety tongs, cable connectors, acid jugs, screw drivers, ladles, belts, vacuum lifter and pickers for punched sheet metal, glass lamp reflector guards, floor mats, locking devices for belt shifter, milling cutter guards, low-head room elevator guards and other devices of a similar nature. Certain products which contain safety features will also be exhibited, among them being arc welding helmets and shields, elevator safety devices, auto lock switches, motor starting switches, multiple circuit safety lighting panels, safety car panels, safety platform panels and auto starters. W. G. Mayer, supervisor of safety appliances for the Westinghouse company, will be in charge of the exhibit, and in addition C. B. Auel, director of standards, processes and materials for the company will be in attendance at the congress.

Beardslee Chandelier Manufacturing Co., 216 South Jefferson street, Chicago, is sending to department stores all over the country a well illustrated folder emphasizing the great improvement in illumination which modern light sources and lighting units can bring about in department stores and other stores. The store-lighting field is one to which few electrical dealers devote sufficient attention. Every intelligent merchant knows the importance of having his store well lighted, but many do not realize the surprising improvement which has been made in lamps and lighting fixtures. If dealers would take the trouble to bring this to their attention, they would find in many instances that the merchant is glad to avail himself of the opportunity to secure better illumination in his store. Denzar, the lighting unit manufactured by the Beardslee company, has proved especially efficient in store lighting, and dealers are urged to put a little intelligent effort back of it and secure the profits which are to be made in this productive field. Copies of the folder are also available to electrical contractor-dealers.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Rutland, Vt.—Rutland Railway Light & Power Co. is understood to be negotiating with the Clarendon Marble Co., West Rutland, for the furnishing of increased electric service in connection with the proposed expansion program of the Clarendon company. It is said that several large additions to the mill are proposed, including the opening of another marble quarry and additions to the marble finishing department.

Springfield, Vt.—Colonial Power & Light Co. has completed the erection of its new substation at Springfield, and it is planned to remove headquarters to the new location. It is understood that practically the entire distribution system of the company will be changed to provide for the furnishing of electric energy to the municipality by the new substation.

Bridgeport, Conn.—Bryant Electric Co. will build a four-story addition to its plant to cost $125,000.

East Norwalk, Conn.—Crofut & Knapp Co., South Norwalk, plans the erection of two plant additions, five stories, 60x300 ft., and three stories, 210x300 ft. A power plant, 60x150 ft. will also be erected.

New Britain, Conn.—Trumbull Electric Co., Plainville, has awarded a contract to Louis A. Miller, 68 Wilcox street, Meriden, for the erection of two new additions to its plant at Plainville, for increased capacity. The structures will be four-story, about 50x106 ft., and one-story, 50x100 ft.

Belmont, Mass.—New England Telephone & Telegraph Co., 50 Oliver street, Boston, has broken ground for the construction of a new two-story and basement telephone building on Leonard street, Belmont, about 36x56 ft., for increased operations. D. L. Shepard, 46 Cornhill street, Boston, is the contractor.

Albany, N. Y.—Henry Ford, of the Ford Motor Co., is understood to be negotiating with the Government officials for the purchase of electric power from the Government power project near Albany for the operation of his local plant.

Canandaigua, N. Y.—Steps are being taken by the Canandaigua Business Men's Association for the installation of a new and improved lighting system throughout the business section of the city.

Cuba, N. Y.—Cuba Electric Light Co. has filed application with the Public Service Commission for permission to acquire the local power plant for increased service.

Hudson Falls, N. Y.—Max Kurtzrook Co., 12 Maple street, Glens Falls, has awarded a contract to the Glens Falls Electric Installation Co., 2 Maple street, Glens Falls, for the installation of a new lighting system in its local plant in connection with other alterations and improvements, the entire work to cost about $10,000.

New York, N. Y.—New York Central Railroad Co. has had plans prepared for alterations and improvements in its one-story brick power house, about 166x236 ft., located on 149th street, near Long Island Sound, to facilitate operations.

New York, N. Y.—New York Edison Co., 30 East 15th street, has commenced active work in connection with the construction of a large new administration building, at Hester and Norfolk streets. Contracts for erection has been awarded to the George Sykes Co., 70 East 45th street.

Utica, N. Y.—Utica Heater Co., manufacturer of heaters, heating equipment, etc., has awarded a contract to John U. Schmidt, 1505 Weston avenue, Utica, for the erection of three new one-story additions to its plant at Whitesboro, to provide for increased capacity. The structures will cost about $20,000.

Watertown, N. Y.—Engineer Sam M. Green, of Springfield, Mass., has prepared plans for a $600,000 municipal power plant to be built here in spring.

Dover, N. J.—New Jersey Power & Light Co. has completed negotiations for the sale of its old Rockaway electric plant to the Standard Oil Co.

Newark, N. J.—American Transformer Co., 178 Emmet street, has awarded a contract to the Salmond Brothers Co., 526 Elm street, Arlington, for the erection of a new one-story extension to its plant. The structure will cost about $5700.

Newark, N. J.—Battery & Electric Service, Inc., 487 Washington street, has filed a voluntary petition in bankruptcy. Alexander Lion heads the company.

Newark, N. J.—Public Service Railway Co. has filed application with the Board of Public Utility Commissioners for permission to purchase a tract of land in Warren street, Trenton, for a consideration of about $45,000, to be used as a site for the construction of a new terminal.

South Plainfield, N. J.—In connection with the construction of a new one-story addition to the plant of the Spicer Manufacturing Co., estimated to cost about $75,000, considerable new electrical and mechanical equipment will be required. Contract for construction has been awarded to Levering & Garrigues, 552 West 23rd street, New York.

Summit, N. J.—Commonwealth Electric Co. has made application to the Board of Public Utility Commissioners to place into effect a new schedule of increased rates for service. The company, in mailing out its monthly bills, attached a circular letter requesting the views of its patrons as regards an increased rate, setting forth that "the Commonwealth company believes that its patrons desire that the company maintain a first-class quality of electric service and that they are willing to pay for that service whatever may be a just and reasonable charge."

Bath, Pa.—A new power plant and waste heat boiler will be installed by the Pennsylvania Cement Co. The Republic Engineers, Inc., 60 Broadway, New York City, engineers.

Carbondale, Pa.—Considerable new electrical and mechanical equipment will be required by the Carbondale Machine Co. in connection with the construction of its proposed one-story machine shop, about 20x220 ft., estimated to cost $60,000. Contract for erection has been awarded to the Hughes Foulkrod Co., Commonwealth building, Philadelphia.

Easton, Pa.—Easton Hospital Association has taken bids for the erection of a new brick and concrete hospital building, nurses' home and power plant for general operation at Lehigh, 20th and 22nd streets, estimated to cost approximately $150,000. William M. Michler, Drake building, is architect; Mrs. Mary Illick, 248 Spring Garden street, is president.

Philadelphia, Pa.—Notaseme Hosiery Co., Mascher and Oxford streets, Germantown, near Philadelphia, has awarded a contract to the Turner Construction Co., 1713 Sansom street, for the erection of the new power house in connection with a new addition to its mill and dye works at Atlantic and I streets.

Philadelphia, Pa. — Philadelphia Suburban Gas & Electric Co. has been awarded a contract for furnishing lighting service to Pottstown for a period of five years. The contract has been approved by the Public Service Commission.

Pittsburgh, Pa. — Westinghouse Electric & Manufacturing Co. has completed the establishment of a new service station on Susquehanna street for the repair of motors and generators both small and large running as large as 40,000 kw. R. M. Rumbel is district service manager.

Pittsburgh, Pa.—H. Kerr Co., 2565 Fifth avenue, has the contract to erect a $45,000 substation for the Duquesne Light Co.

Springdale, Pa.—Progress is be-

ing made by the West Penn Power Co. on the construction of its large new local power plant, estimated to cost about $6,000,000. When completed the development of about 16,000 hp. will be the capacity of the plant, which is expected to be in complete operation some time next spring.

Beech Bottom, W. Va.—American Gas & Electric Co. has completed negotiations for the purchase of a large tract of coal properties near Wheeling from the Richland Coal Co., comprising about 4000 acres, to be used by the new owner for the furnishing of fuel for the operation of the large electric power station of the company at Beech Bottom. It is said that the property has an annual production of about 400,000 tons.

Norfolk, Va.—Norfolk Electric Manufacturing Co., 215 Cumberland street, is considering plans for the erection of a new plant to be devoted to the manufacture of induction motors of one to five horsepower rating. Porter O. Sutton is general manager.

Richmond, Va.—Tower-Binford Electric & Manufacturing Co. plans the erection of a one-story building, 90x116 ft., to cost $35,000.

Baltimore, Md.—Bids are being taken by the Consolidated Gas, Electric Light & Power Co., Baltimore, for the erection of a new two-story addition to its Westport service station, about 53x58 ft.

Baltimore, Md.—Maryland Casualty Co., Baltimore street, will build an electric light plant.

Simpsonville, S. C.—Election will be held Oct. 3 to vote on the question of issuing $10,000 municipal bonds for establishing an electric light plant. Address L. L. Richardson, mayor.

Augusta, Ga.—Hulse Steam Laundry Co. will purchase electrical equipment.

Plains, Ga.—Election will be held Oct. 14 to vote on the question of issuing $6500 municipal bonds for establishing electric light plant. Address H. R. McGee, mayor.

NORTH CENTRAL STATES.

Findlay, Ohio—Electric Motor & Construction Co. will shortly commence the erection of a two-story plant, 50x200 ft.

Lebanon, Ohio—$120,000 municipal light bonds will be offered for sale Oct. 3. M. E. Gusten, city clerk.

Norwood, Ohio—Norwood's municipal electric light plant and waterworks, Pine and Harris avenue, was damaged to the extent of approximately $50,000 by fire caused by the explosion of a gas engine used as a power generator in the light plant.

Youngstown, Ohio—Youngstown Sheet & Tube Co. contemplates erecting a high-tension power plant at Alikanna so as to be near the proposed coal fields and in case such plant is built, the coal road will be built up Wills Creek and not up from Reeds Mills to Richmond.

Anderson, Ind.—Union Traction Co. will expend $100,000 on its central power plant, installing boilers and overhauling electric turbogenerators.

DATES AHEAD.

National Association of Electrical Inspectors. Annual meeting, Springfield, Mass., Oct. 13 and 14. Secretary, W. L. Smith, Concord, Mass.

Illuminating Engineering Society. Annual convention, Chicago, Ill., Oct. 20-23. General secretary, Clarence L. Law, 29 West 39th street, New York City.

Illinois State Electric Association. Annual convention, Chicago, Oct. 22 and 23. Secretary-treasurer, R. V. Prather, Springfield, Ill.

Empire State Gas and Electric Association. Annual meeting, Buffalo, N. Y., Oct. 24. Secretary, Charles H. B. Chapin, 29 West 39th street, New York City.

American Society of Mechanical Engineers. Annual meeting, New York City, Dec. 2-5. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

National Council of Lighting Fixture Manufacturers. Annual convention, Detroit, February, 1920. Secretary-treasurer, Charles H. Hofrichter, Cleveland, Ohio.

Auburn, Ind.—Auburn school board will issue bonds in the amount of $70,000 for completing McIntosh high school and for installing a heating plant therein.

Bluffton, Ind.—Indiana Public Service Commission has granted authority to the city of Bluffton to issue bonds in the amount of $15,000 to apply on the purchase of a new 1000-kw. turbine for the municipal light plant.

Evansville, Ind.—Globe Bosse World Furniture Co. will erect an addition to its factory to cost between $150,000 and $200,000.

Evansville, Ind.—Crown Chair Co. will build factory building to cost $75,000.

Hammond, Ind.—The second battery of 60 coke ovens of the Mark Manufacturing Co., Indiana Harbor, Ind., has begun production with capacity of 1200 tons of coal daily. This makes a total of 120 ovens in operation and two additional batteries of sixty ovens each are planned.

Indianapolis, Ind.—Wheeler-Schebler Carburetor Co. will erect three factory buildings at an estimated cost of $100,000. One building will be 132 x108 ft., and two smaller buildings 20x50 ft. each.

Indianapolis, Ind.—Stickney Color Co. will erect a three-story factory building, brick and concrete over hollow tile, 50x100 ft.

Indianapolis, Ind.—F. J. Groth, Toledo, Ohio, manufacturer of leaf springs for automobiles, will erect a one-story, fireproof building, 500x60 ft., to cost $100,000. The lower part of the building will be of concrete and brick and the upper part of steel construction. Oil burning forges will be used.

Laporte, Ind.—Wanatah Electric Co. has changed its name to the Wanatah-LaCrosse Electric Co.

Logansport, Ind. — Logansport Utilities Co., which has taken over the plant of the Logansport Heat & Power Co. from the receiver, will make improvements costing about $25,000 this fall.

Muncie, Ind.—Ground has been broken for the first of a series of factory buildings for the General Motors Corporation. This building will be 300x500 ft. The corporation is equipping the Interstate automobile factory buildings with machinery and will begin work Nov. 1 with a force of 2000 men.

Shelbyville, Ind.—St. Paul Electric Light & Power Co. has been organized by a number of residents of the town and community. The company will investigate the advisability of constructing a dam across Flat Rock River at St. Paul and the construction of an electric light plant at that point to provide power and light for Shelbyville and Greensburg and towns and farms along the route between the two towns. John T. Guskedon is the president. The directors are L. A. Eckhart, F. M. Howard, George Boliny and Raymond Pleak.

Amboy, Ill.—The city is considering the matter of a new contract with the Northern Illinois Utilities Co. for electric power for pumping city water.

Bement, Ill.—J. R. Boers, T. E. Hughes and J. M. Capel of Champaign, Ill., and Roscoe Lewis and George Neusome of Carbondale, Ill., have purchased the plant of the Bement Electric Light & Power Co. Service will be extended to Sadorus, Ill., 10 miles distant.

Blue Island, Ill.—American Wire Fabric Co. has commenced the erection of an addition to its works. This will involve an expenditure of about $1,000,000 including machinery.

Chicago, Ill.—Arthur Jones Electrical Co., manufacturer of electrical equipment for automobiles, 2837 South State street, has engaged the F. M. Barton Co., architect, to prepare plans for a one and two-story factory, 125x125 ft., to be erected at the northeast corner of Calumet avenue and 29th place. The new structure is to cost $60,000.

Chicago, Ill.—Federal Electric Co. has retained George C. Nimmons & Co., architects, to prepare plans for a one-story factory and boiler house to be erected at the southwest corner of State and 87th streets.

Chicago, Ill.—H. G. Fisher & Co., 2341 Wabansia avenue, manufacturer of X-ray machinery, have arranged for the immediate construction of a three-story plant, 60x110 ft., involving an expenditure of about $70,000.

New Athens, Ill.—East St. Louis, Columbia & Waterloo Railway Co. has been asked to extend its electric lines to New Athens.

Pekin, Ill.—It is proposed to establish an electric lighting plant here.

Rock Island, Ill.—Coe Light & Power Co. will construct and operate electric distribution line in Coe township, Rock Island county.

Detroit, Mich.—Detroit Edison Co. has had plans prepared for the construction of a two-story substation,

25x113 ft., at Connor's Creek, near Six Mile Road. Estimated cost, $40,000.

Peshtigo, Wis.—Contract has been awarded to the Jorgenson Construction Co., Denmark, Wis., for the erection of a two-story brick and concrete mill and factory building by the Peshtigo Pulp & Paper Co. The structure will be 70x242 ft. and cost about $64,000. The paper and pulp machinery will cost about $75,000.

Bucks Grove, Iowa—$6000 in bonds have been voted to secure electric current from Denison.

Dubuque, Iowa—Eastern Iowa Electric Co. wishes to extend its lines from Peosta to points in Vernon, Prairie Creek, Whitewater and New Wine townships.

Palmyra, Mo.—City is having plans prepared for the construction of a new municipal electric light and power plant. Bonds for $10,000 for the proposed work were recently authorized.

Auburn, Neb.—Engineers Archer & Stevens, 609 New England building, Kansas City, Mo., are preparing plans for $100,000 electric light plant. The specifications include generators, transformers, engines, tanks and starters.

Douglas, Neb.—Nebraska Telephone Co., 18th and Douglas streets, is reconstructing line from Holdrege to Elwood.

Guide Rock, Neb.—This town has approved a bond issue for electric lights and power. Address clerk of village board.

McCook, Neb.—Citizens are signing a petition asking the Nebraska Telephone Co., 18th and Douglas streets, Omaha, to place wires underground in paving district.

Plainview, Neb.—At a special election the vote was strongly in favor of issuing $12,000 bonds for an ice plant and $24,000 for the extension of electric light plant, and a new unit.

Parker, S. D.—A new lighting system is necessary. It would cost $40,000 to install a two-unit steam engine outfit. The expense of getting power to the city wires by the Hartford Light & Power Co. would be $25,000. Address City Auditor C. S. Jones.

Wakonda, S. D.—Arrangements are being made for the city to purchase the local electric light plant and operate it as a municipal system. The necessary improvements will be made and the scope of the plant enlarged.

Carrington, N. D.—Mercantile Co. will install a private electric lighting plant to be installed here.

Oneida, S. D.—An election will be held to vote on the question of issuing $30,000 in bonds for municipal light and water system. Address village clerk.

SOUTH CENTRAL STATES.

Gadsden, Ala.—Alabama Power Co., Birmingham, has awarded a contract to the Dixie Construction Co., Birmingham, for the construction of a new 110-kv. line to extend from Gadsden to Huntsville; and a 44-kv. line from Huntsville to Decatur, Ala.

Sheffield, Ala.—Fire has destroyed Warehouse No. 4 of the J. G. White Engineering Corp. at Muscle Shoals, the loss being $2,000,000, mainly on electrical equipment.

Sheffield, Ala.—Permission has been granted the government by the city authorities to erect transmission lines through the city's corporate limits between Nitrate Plant No. 2 in East Sheffield, and Nitrate Plant No. 1 in West Sheffield. The lines will be used to transmit power at the large power plant at Plant No. 1 to Plant No. 2, and the two plants to be operated from one station instead of using the stations at both plants. A 90-day test is in progress at Nitrate Plant No. 2 to determine the actual cost of the production of electrical energy by steam through the medium of one of the largest steam driven turbines.

Paducah, Ky.—City commissioners have called a special election in November for the purpose of voting on the issuance of bonds for $100,000, the proceeds to be used for improvements in the municipal electric light plant.

Campti, La.—The electric plant and garage of J. E. Clontier were destroyed by fire. There was no insurance to cover total loss of $2400.

Lexington, Miss.—City council, which recently voted $20,000 additional bonds, has awarded a contract to Williams & Lebby, Yazoo City, for the installation of a new municipal electric light system. W. L. Jordan is city clerk.

Little Rock, Ark.—Arkansas Hydroelectric Co. has increased the scope of the project to include two dams instead of one, providing a much larger output of electrical energy.

Eufaula, Okla.—City has awarded a contract to Cornstock & Hanson, Tulsa, for extensions in the municipal electric light and water systems. The city recently authorized a bond issue for $25,000 to cover the cost of the proposed work.

Sulphur, Okla.—Sulphur Ice, Light & Power Co. is understood to be considering plans for the installation of a quantity of new machinery in its local plant to provide for increased operations. The work is estimated to cost about $30,000.

Bryan, Tex.—It is stated by City Manager J. W. Greer that he will purchase about $30,000 worth of machinery for the electric power plant here which was recently purchased by the municipal government from the proceeds of a $75,000 bond issue.

Galveston, Tex.—The city commission has instructed W. D. Masterson, city electrician, to compile data and draw plans for a proposed municipal electric light and power plant here. Construction of the proposed plant will be submitted to the people in the form of a charter amendment at the election to be held during the early part of next year.

Houston, Tex.—Houston Light & Power Co., one of the properties of the American Cities Co., has awarded contract to Horton & Horton, Houston, for extensive additions to its plant for increased capacity, estimated to cost in excess of $400,000, including equipment. It is proposed to install a new Westinghouse turbine with oil auxiliaries, new water-tube boilers, steam piping, water screens, etc. Harry E. Badger is engineer for the company.

Lufkin, Tex.—An ornamental lighting system is to be installed here under the direction of City Manager Mitchell.

WESTERN STATES.

Benson, Ariz.—Arizona Smelting & Power Co. will soon install the generators and other equipment for its new electric power plant here. The company has contracted to furnish power for the town of Benson.

Loveland, Colo.—The city will construct a power plant where there will be sufficient water fall to run the plant. Water power with new modern machinery will be used for the distribution of electricity. Address Lewellen Osborne, city engineer.

Missoula, Mont.—Missoula Light & Water Co. will remodel its power dam, this work to cost approximately $85,000. The extensive improvements which are now in progress will make the plant more modern, provide a greater water storage and more power and will furnish a means of regulating the flow of water through the dam.

Brandon, Ore.—The council is considering ways and means to secure an electric power plant. Address mayor.

Florence, Ore.—The Florence electric plant owned by G. G. Bushman of Eugene was destroyed by fire. The plant may be rebuilt.

Everett, Wash.—The commissioners are considering ways and means to secure electric light and power plant, Engineer R. E. McDonnell of Burns & McDonnell, Kansas City, having been instructed to collect data regarding the local holdings of the Puget Sound Power Co. This will be submitted to voters at the November election. Address city clerk.

Montesano, Wash.—The electric generator plant of Northwestern Electric & Water Works, supplying electric energy for this plant and Elma, exploded recently.

Spokane, Wash.—It is probable that the citizens will vote in November on a proposal to amend the city charter to allow the city to purchase the power plants and traction lines of the Spokane & Inland Empire Railway Co. The Great Northern, in such event, may undertake the operation of the Inland Empire's interurban car lines.

Pasadena, Cal.—Warnerlite Co., Davenport, Iowa, manufacturer of lighting plants and electric automobile equipment, is having plans prepared for the erection of a new plant on South Marengo avenue, Pasadena. It will be of reinforced concrete and for initial operation will comprise a one-story factory, 260x300 ft., and administration building, 80x100 ft., with two wings, each 60x80 ft. The cost will be about $100,000.

Richmond, Cal.—Pacific Oil & Lead Co. will install new electric motors

and operating machinery at its work to provide increased capacity.

San Diego, Cal.—Electrical apparatus installed in the new stadium provided means for 50,000 persons to hear President Wilson distinctly when he spoke in this city Sept. 19. It was expected that the San Diego crowd would be the largest which would hear President Wilson at any point on his tour.

FOREIGN TRADE

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electrical Apparatus (30,633).—A commercial agent in Czechoslovakia desires to purchase and secure an agency for the sale of electrical measuring instruments, electrical meters, installation material, telephone equipment, bells, etc. Payment United States currency. Correspondence may be in English. Reference.

Electrical Apparatus (30,679).—A firm in Roumania desires to purchase technical articles, such as asbestos packings, hemp packings, rubber articles, transmission belts, cast iron water pipe and ventilators and articles for blacksmiths; articles for cellars and breweries; pumps, agricultural and flour-mill machinery; oil-well supplies, motor machinery; electrical apparatus; machinery and tools for wood working; laundry machinery; ice-making machines, etc. Correspondence may be in English. References.

PROPOSALS

Power Plant Equipment.—Bids will be received until Oct. 22 by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for power plant equipment at Pearl Harbor.

Electric Lighting System.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 1 for installing electric light, water supply and fire protection systems at Charleston, S. C. Estimated cost $30,000. A deposit of $10 is required for plans and specifications. (Specification 3977A).

Electric Work.—Bids will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., at 3 p. m., Oct. 6 for furnishing materials for the construction of the United States Post Office at Marianna, Ark., including materials for concrete, reinforced concrete, stone, granite, brick, structural terra cotta, structural steel, miscellaneous iron and steel work, composition roofing, slate roofing, sheet-metal work, skylights, plastering, interior marble, sanitary slate, lumber, millwork, plumbing, heating, electric work, etc., in accordance with drawings, specifications and bills of quantities attached thereto. Copies of these may be obtained from the custodian of the site at Marianna, Ark., or at the above office, in the discretion of the Supervising Architect. James A. Wetmore, acting supervising architect.

Boilers, Turbogenerators, Etc.—The Board of Public Works of Seattle, Wash., is asking for sealed bids up to 10 a. m., Oct. 3, 1919, for the furnishing of all labor and material for the construction and installation of an additional unit in the Seattle steam-electric plant at Lake Union, in accordance with plans and specifications on file in the office of secretary of Board. The requirements are as follows: Six water-tube boilers to be set in batteries of two boilers to each battery, each boiler to have approximately 8250 sq. ft. of water-heating surface, and is to be equipped with feed-water regulator, an oil-burning furnace, superheater, and all the specified fixtures and instruments, feed-water heaters and other equipment for a complete installation; also, a steam turbogenerator and exciter, the commercial rating of the generator to be 10,000 kw. at 80% power factor, to operate at 2500 volts alternating current, 60 cycle, 2 phase; the exciter potential is to be 125 volts, and is to be a horizontal, direct-connected unit, consisting of an induction motor, steam turbine and direct-current generator.

INCORPORATIONS

Dixon, Ill.—Lee Power & Light Co. has been incorporated with capital of $10,000 to provide lights for the village of Lee, near this city. The incorporators are David L. Heburg, James E. Johnson and Emanuel Anderson.

Elizabethtown, N. C.—Bullard Telephone Co. has incorporated with a capital of $20,000 to operate a system in Blaiden, Robeson, Sampson, Cumberland and Pender counties.

Ashley, Ind.—Farmers Light & Power Co. has been incorporated with capital of $10,000 to distribute light and power in Ashley and rural districts surrounding. Address I. D. Deller, Ashley, Ind.

New York, N. Y.—Empire Repair & Electric Welding Co. Capital, $1,000,000. To operate a general electirc repair and welding establishment. Incorporators: E. F. Luckenback, R. C. Thackhara, and C. Kuhne, 44 Whitehall street.

New York, N. Y.—Endurance Battery Co. Capital, $25,000. To manufacture electric batteries. Incorporators: J. H. Sweiback, R. Guinzburg. and A. G. Meinecke, 3920 Broadway.

Mountaindale, N. Y.—Subscribers Service Telephone Co., Inc. Capital, $50,000. To operate a telephone system through Sullivan and Ulster counties. Incorporators: P. H. Groginsky, M. Kaplan, Woodridge, and G. Culligan, Mountaindale.

Syracuse, N. Y.—Syracuse Electric Service, Inc. Capital, $50,000. To engage in general electrical contracting, etc. Incorporators: D. F. Costello, G. E. Poseo, and C. E. Cooney, Syracuse.

Syracuse, N. Y.—Myrtle-Siegel, Inc. Capital, $15,000. To manufacture electric lamp shades. Incorporators: F. L. Siegel, H. B. and G. E. Myrtle, Syracuse.

Dover, Del.—Electric Auto Lite Corp., 244 West 49th street, New York, incorporated under Delaware laws with a capital of $100,000.

Philadelphia, Pa.—Fairchance Stove Co. incorporated under Delaware laws with a capital of $200,000. To manufacture electric and gas stoves of all kinds, etc. Incorporators: F. R. Hansell, E. MacFarland, and J. V. Pimm, Philadelphia.

Knoxville, Tenn.—Alamo Knoxville Farm Light Co. Capital, $25,000. To manufacture electrical specialties, etc. Frank O'Connor is the principal incorporator.

Portland, Ore.—Portland, Astoria & Pacific Ry Co. has incorporated with a capital of $5,000,000. David C. Eccles is president of the new company and the bulk of the financial backing of the concern is supplied by the Eccles timber interests. Headquarters have been established at Ogden, Utah, and Charles T. Early, secretary of the company, will have charge of the Portland office. The company proposes to build and operate railroads, telegraph and telephone lines. It has now under construction a line 32 miles in length extending from Wilkesboro.

Dover, Del.—Automobile Burglar Alarm Co. Capital, $1,000,000. To manufacture electrically operated burglar alarm systems for automobile service. W. I. N. Lofland, Frank Jackson, and Charles H. Jones are the incorportaors.

Greensboro, N. C.—Guilford Storage Battery Co. Capital, $25,000. To manufacture storage batteries. J. U. Lindsay is the principal incorporator.

New York, N. Y.—R. W. Lillie Corp. Capital, $25,000. To engage in a general electrical and mechanical engineering capacity. Incorporators: R. W. Lille, Greenwich, Conn.; L. Skipwith, and R. J. Knoeppel, 5 Beekman street, New York.

Sisterville, W. Va.—West Virginia Light, Heat & Power Co. has incorporated with a capital of $75,000. Incorporators: A. R. Lord, T. C. Davidson and others.

New Brunswick, N. J.—Perth Amboy Storage Battery & Electric Co. Capital, $25,000. To manufacture storage batteries, electrical goods, etc. Incorporators: John J. Orsoe, Joseph H. Copeland, and Frederick C. Schreiber, Perth Amboy.

Martinsburg, W. Va.—Martinsburg Heat & Light Co. Capital, $100,000. To operate a local plant. Incorporators: A. H. Ritter, J. Gates, Carl W. Fenninger, Philadelphia; H. W. Comfort, Falsington, Sir John Franklin, and Wilbert R. Goodwin, Millsville.

Personals

W. H. Johnson New President of Association of Edison Companies—E. H. Martindale Leaves National Carbon

ROMAN PODSKI has been appointed recently by the Polish Government to journey to the United States to make a close study of the electrification of railroads in this country.

D. J. KERR, electrical engineer at the Canton (N. C.) plant of the Champion Fibre Co., has been appointed superintendent of the power department in connection with the electrical department.

PROF. ROY KEGERREIS, formerly instructor in electrical engineering at the University of Pennsylvania, has been appointed professor of electrical engineering at the local college at Newark, Del.

WALTER HOWARD JOHNSON, president of the Association of Edison Illuminating Companies, is vice-president of the Philadelphia Electric Co.

Walter H. Johnson.

Mr. Johnson was born Aug. 1863, at Philadelphia and received his education in the public schools of that city. He gained his early business experience in the local mercantile field, and before engaging in electrical work was in the service of the Philadelphia, Wilmington & Baltimore Railroad and later with the Pennsylvania Railroad Co. On Nov. 7, 1887, he accepted a position with the Edison Electric Light Co. of Philadelphia, and has since been continuously active in the affairs of the public utilities enterprises serving Philadelphia and surrounding territory, subsequently becoming secretary of that corporation. In 1898 the company was acquired by the Pennsylvania Manufacturing Light & Power Co., which was taken over by the Philadelphia Electric Co. when the latter was incorporated, Oct. 6, 1899, and it is of this organization that Mr. Johnson is a director and vice-president. He is a member of the Pennsylvania Society of the Sons of the Revolution, a life member of the Navy League of the United States, and a member of the Franklin Institute of Pennsylvania.

H. H. HARDING has been appointed superintendent of the Hudson (Wis.) division of Northern States Power Co., succeeding F. Hardwick, who was transferred to the Stillwater division.

CHARLES H. LEATHAN, Frostburg, Md., formerly manager of the plant of the Frostburg Illuminating & Manufacturing Co., a subsidiary of the Hagerstown & Frederick Electric Co., has been appointed assistant manager of the parent company.

GEORGE W. HARRIS, for the past fourteen years connected with the Bartels Brewing Co. as electrical engineer, has become associated with the Syracuse Cold Storage Co., Syracuse, N. Y., in the capacity of electrical engineer. The latter company expects shortly to electrify its plant and install new equipment.

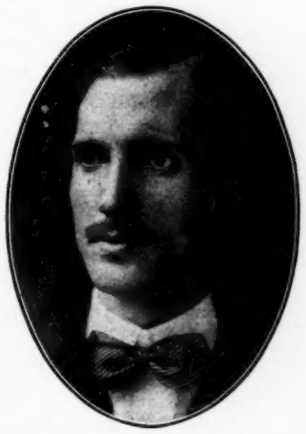
ARTHUR E. LUBECK, until recently manager of the Detroit office of the Benjamin Electric Manufacturing Co., Chicago, has become associated with the Hart & Hegeman Manufacturing Co., Chicago, manufacturer of electric switches, receptacles and accessories, in the capacity of assistant western sales manager. Mr. Lubeck was for eight years in the service of the Benjamin company, during which time he covered all the central west jobbing territory. For the past two years he has been manager of the Detroit office resigning that position to join the Hart & Hegeman organization.

L. E. STROTHMAN, for several years manager of the steam turbine and pumping engine department of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has resigned to become vice-president and general manager of the Richardson-Phenix Co. Prior to his connection with the Allis-Chalmers company he was associated with the Filer & Stowell Co. and the Nordberg Manufacturing Co. Mr. Strothman is well known in manufacturing circles and is prominently identified with various engineering societies.

C. F. UHDEN, Spokane, Wash., formerly chief engineer for Washington Water Power Co., has been appointed to the position of construction engineer for Seattle, to supervise the building of that city's hydroelectric power plant on the Skagit river. The appointment, made by A. H. Dimock, city engineer, and approved by Mayor Fitzgerald, has been accepted by Mr. Uhden, whose salary will probably be $7500 per year. Mr. Uhden was graduated from the State College of Washington in 1903, and soon thereafter entered the employ of Washington Water Power Co., advancing steadily until he reached the position of chief engineer. While serving in that capacity, he supervised the construction of that company's Long Lake hydroelectric plant, which ranks among the best of those in the Northwest.

CAPT. H. G. DAVIS, recently returned from overseas, has joined the staff of Davis & Armstrong, Inc., Minneapolis, Minn., where he will succeed S. L. Sholley, now advertising manager of the Babson Statistical Organization, Wellesley Hills, Mass. Captain Davis was connected with the W. E. Davis Advertising Service before going overseas. He took part in important artillery engagements of the American forces and was decorated by the French government with the Croix de Guerre.

E. H. MARTINDALE has resigned as sales engineer of the National Carbon Co. to accept the position of president and general manager of the Handy Supply & Manufacturing Co., Cleveland, Ohio, in which he has been interested in an advisory capacity for three or four years. Following Mr. Martindale's graduation from Case School of Applied Science in 1908, he entered the employ of the Indiana Steel Co., Gary, Ind. In October, 1909, he joined the staff of the National Carbon Co. and has become one of the best brush engineers in the country. He has been a frequent contributor to the technical press, and was the author of a series of articles on the care and operation of motors and generators, which appeared in the ELECTRICAL REVIEW a number of years ago. For two years he was chairman of the Industrial and Domestic Power Committee of the American Institute of Electrical Engineers and is at present a member of the board of directors of that association. During the war Mr. Martin served as a captain of Engineers and spent one year in France. The Handy Supply & Manufacturing Co. handles a line of commutator stones, commutator slotting files, insulating varnishes and other electrical specialties. Its products are used in nine foreign countries as well as in every state in the Union.



E. H. Martindale.

NEXT CONFERENCE, CHICAGO, ILL., OCTOBER 30-31, 1919

Executive Committee
JOSEPH HARRINGTON, Chairman,
James A. Brady Foundry Co.
AINSLIE A. GRAY, Vice-Chairman,
A. A. Gray & Co.
H. C. SHIELDS,
Fuller Engineering Co.
JOSEPH W. HAYS,
Joseph W. Hays Co.
A. P. PECK,
Consulting Engineer.
A. W. PATTERSON,
Engineer Co.
I. L. KENTISH-RANKIN,
Electrical Review.

Committee to Co-operate with Fuel Administration
F. A. MORELAND,
Vulcan Fuel Economy Co.
JOSEPH W. HAYS,
Joseph W. Hays Co.
C. E. BRAINARD,
Brainard-Fairchild Engineering Co.
DAVID MOFFAT MYERS,
Griggs & Myers.

Committee on Foreign Trade
F. H. C. COPPUS,
Coppus Engineering & Equipment Co.
H. W. DOW,
Nordberg Mfg. Co.

Committee on Combustion
G. S. CARRICK,
Carrick Engineering Co.

Committee on Solid Fuels
H. J. MEYER,
Administrative Engineer,
U. S. Fuel Administration,
Minneapolis, Minn.
O. P. HOOD,
Bureau of Mines,
Washington, D. C.
CARL SCHOLZ,
Valier Coal Company.

Committee on Washed and Pulverized Fuel
B. J. ROBERTS,
Deister Concentrator Co.
FREDERICK SEYMOUR,
Aero Pulverizer Co.
H. C. SHIELDS,
Fuller Engineering Co.
E. C. BRAINARD,
Brainard-Fairchild Engineering Co.

Committee on Oil Fuels
W. G. WILLIAMS,
Oklahoma City Oil Co.
W. T. DEAN,
General Combustion Co.
MAX SKLOVSKY,
Deere & Co.

Committee on Steam Engines
B. V. E. NORDBERG,
Nordberg Mfg. Co.
H. J. GEBHARDT,
Consulting Engineer.

Committee on Steam Turbines
H. W. CROSS,
General Electric Co.
ERWIN DRYER,
Allis-Chalmers Mfg. Co.
S. WOLFF,
DeLaval Steam Turbine Co.

Committee on Boiler Settings.
ALBERT GOETZ,
Jointless Firebrick Co.
ARTHUR W. KNIGHT,
Celite Products Co.

C. A. TUPPER, Chairman of Conference H. EHRLICH, Secretary

INTERNATIONAL POWER ECONOMY CONFERENCE

OFFICE OF THE EXECUTIVE COMMITTEE
1547 MARQUETTE BUILDING

CHICAGO

SEPTEMBER 23, 1919.

MY DEAR SIR:

During the war, under the whip of stern necessity and moved by a staunchly patriotic impulse, the industrial forces of America joined hands with the Government to co-operate with the representatives of the United States Fuel Administration in conserving the fuel resources of the nation.

Diminution of labor at the mines, through enlistment and the draft, tremendous demand for fuel for industrial power and for ship and rail transportation, congestion of rail and waterway transportation and a winter of unusual severity, all combined to bring about an unprecedented situation as it affected power resources. Out of this emergency was born the United States Fuel Administration, to the personnel of which were drawn many of the most prominent and able fuel engineers and economists of the times.

Study of resources, fuel production, transportation and the operation of power plants brought out volumes of invaluable information, resulting in many suggestions for stimulating production, for regulating transportation, and most important of all, for increasing the efficiency of power plant operations. While the recommendations of the United States Fuel Administration were at all times advisory, they were, for the greater part, complied with the same fidelity as if they were clothed with official authority and therefore mandatory. They were war measures, and the power plant managers of the nation were "for them."

With the signing of the armistice reaction set in. Fuel production was being well maintained, transportation difficulties were being ameliorated, intensive industrial production was being tapered off, measures looking to increased efficiency had been applied, the men who had given freely of their time and energies to the work of the Government were required in office and factory to gather together again the broken threads of their own business—to put their houses in order and to begin again the routine of business and industrial life.

The United States Fuel Administration was a war product. With the coming of peace all signs pointed to its passing. What was to become of the mass of information

Committee on Boiler Feed
A. SORGE, JR.
A. Sorge, Jr. & Co.
I. L. KENTISH-RANKIN,
Electrical Review.
W. F. SCHAPHORST,
Geo. H. Gibson Co.

Committee on Water Purification
M. F. NEWMAN,
W. B. Scaife Co.
H. W. WILDING,
Roberts Filter Mfg. Co.

Committee on Steam Superheating
L. B. NUTTING,
Power Specialty Co.

Committee on Cooling and Condensing Systems
B. H. COFFEY,
The Cooling Tower Co., Inc.
OSCAR J. WEST,
Spray Engineering Co.
J. J. BROWN,
Wheeler Condenser & Engineering Co.

Committee on Insulation and Boiler Covering
R. J. STEWART,
H. W. Johns-Manville Co.
LAWRENCE L. SHAILER,
Ehret Magnesia Mfg. Co.

Committee on Piping and Pipe Accessories
B. J. HAUSFELD,
Lunkenheimer Co.
A. S. WINTER,
William Powell Co.
R. C. McWANE,
Sec'y Cast-Iron Pipe Publicity Bureau.
M. B. SKINNER,
M. B. Skinner & Co.

Committee on Coal Storage and Handling
H. H. STOEK,
University of Illinois.
C. C. FORD,
Jeffrey Mfg. Co.
WM. H. LANG,
C. W. Hunt Company.

Committee on Ash Handling
L. A. GRIFFIN,
American Steam Conveyor Corp.
C. F. MESSINGER,
Chain Belt Co.

Committee on Recording Instruments
FRANCIS W. CARRET,
Foxboro Co.
J. W. LAZEAR,
Brown Instrument Co.
J. M. SPITZGLASS,
Republic Flow Meter Co.
W. D. HESS,
Builders' Iron Foundry.
E. G. BAILEY,
Bailey Meter Co.

Committee on Lubricants
R. M. SHATTUCK,
Acheson Graphite Co.
DUDLEY K. FRENCH,
Dearborn Chemical Co.

that had been gathered? Were the gains in efficiency to be discounted by slipping back into unscientific and wasteful methods? Was all this good work to stop with the demobilization of the United States Fuel Administration?

These were the questions that inspired the getting together at Chicago, Ill., on December 6, 1918, of a number of members of the United States Fuel Administration, power plant operators, manufacturers of power plant apparatus and accessories, and publishers of technical journals to discuss the problem and evolve, if possible, some means for perpetuating the work started by the Fuel Administration.

The meeting resulted in the International Power Economy Conference. Resolutions were adopted, recommending such action by Congress as would result in giving to some Federal bureau sufficient funds and authority to continue the work of the United States Fuel Administration, to the end that the enormous savings in the production and utilization of the fuel resources of the country which preliminary investigation has revealed as possible, might actually be accomplished through the mature study of the subject that a permanent Federal agency could undertake.

An Executive Committee was appointed to devise ways and means for developing interest in the International Power Economy Conference and subsequently committees were appointed to represent various phases of power plant economy. These committees were to analyze the relation of various apparatus and appliances to the general subject and to report in a tentative way upon the part each might play in co-ordinating the efforts of all to bring about a greater appreciation of the advantages which accrue from the scientific application of apparatus designed to increase power plant efficiency.

It has been a busy year for all of us; each has borne a burden which has tested to the limit mental and physical endurance But the ultimate reward for all effort will come only as the problem of increasing power plant efficiency is solved.

We are approaching another crisis in fuel production and utilization. Fuel economy bears a most important relation to the cost of living. And it is necessary now, as it was when war was upon us, to get together and talk it over.

But we must do more than that. Out of the changed conditions that now confront us; out of the experiences of the last ten months, we must determine whether this work shall go on. We must determine whether the International Power Economy Conference has a work to do. If it has a work to do, on what basis may a permanent organization be developed, what will be its affiliations and what measure of financial support may be expected from those in whose interests it will be fostered?

A conference is therefore called to meet at Chicago, Ill., October 30-31, to present reports from such committee chairmen as have had opportunity to complete their analysis of their division of power plant activity and to invite speakers conversant with the factors upon which fuel conservation and power plant economy are based.

Does the matter interest you? Will you come to the conference? Will you come, if only to listen? Will you come and make suggestions, if after listening in, the subject takes hold of you? The Executive Committee will be glad to have advance knowledge to the greatest extent possible of those who will be in attendance. And if you have any ideas on the subject they will be welcome in the formulating of the program.

The place of meeting will be determined and full particulars will be forwarded to you at an early date.

Cordially yours,

C. A. TUPPER,

Chairman of Conference.

Financial News

Effect of Unsettled Conditions on European Production and Credit.

Until peace is definitely concluded by the ratification of the peace treaty, European production will be held back and credit risks will be, to an extent, insecure. In certain parts of Europe, notably eastern and southeastern Europe, armies are not yet demobilized, crops are not up to a safe margin, and economic reconstruction is being postponed. The danger of this situation is cumulative. Bad conditions become worse. Political jealousy and social unrest feed upn idleness and hunger.

The solution of the problem presented by this zone of demoralized life is a definite political settlement and a return to work. You can not work and construct when there are no rules of the game. Reconstruction, moreover, involves raw material and machinery to work with. Most of these upset countries have only Government bonds to offer in payment for goods desired. Before bankers can safely underwrite such loans and offer them to American investors, these countries must have definite boundaries, definite obligations, and there must be a guarantee that the stronger nations will keep the peace in these regions, by moral influence and even by coercive measures if necessary.

The problem of credit to even the strongest nations is difficult until the peace settlement is concluded. Whatever one's views about the proper nature of the peace settlement, all may readily see and agree that foreign credit arrangements are being delayed until a peace settlement assures stabilized conditions. Without adequate provisions for foreign credits there can be no remedy for the exchange situation which is automatically increasing prices foreign purchasers have to pay for American goods. With foreign currencies depreciated as they are today, old-established American businesses abroad are finding in certain cases that they are confronted with lower prices from competing countries.

With the peace settled there is good reason for confidence that the credit situation can be so handled as to assist European nations to restore their production and at the same time assure an adequate market for American exports. Export trade is a source of national prosperity if payment can be secured, either in the form of imports or deferred payment in the form of safe foreign securities. If the unsettled period can be tided over, the United States is faced with a splendid opportunity for service and profit in the world's markets.

Robbins & Myers Note Issue.

An issue of $2,500,000 of 6% notes of the Robbins & Myers Co., Springfield, Ohio, are being offered by Kissel, Kinnicut & Co., New York, and the Maynard H. Murch Co., Cleveland. These notes, dated Sept. 1, 1919, mature $500,000 annually, on Sept. 1, 1920, to 1924, and yield from 6 to 6.35%. They are redeemable on any interest date prior to maturity upon 30 days' notice as a whole or in blocks of not less than $500,000, in which event the company must call for redemption notes of one or more of the series last maturing, upon payment of a premium of one-fourth of 1% for each six months between the date of redemption and the date of maturity, with a minimum redemption of one-half of 1%.

In addition to this issue the company has outstanding $2,395,000 out of $2,500,000 authorized preferred stock and $1,250,000 authorized common stock. The estimated sales in 1919 were $9,000,000, as compared with $6,961,076 in 1918 and $5,758,335 in 1917. The proceeds of the note issue will be used in reduction of floating debt. Average net earnings for the six years ended Dec. 31, 1918, before federal taxes, amounted to five and one-third times and for the calendar year 1918 amounted to over eight times the largest annual interest requirements on the notes. Based on earnings of the first six months of 1919, the estimated earnings for the year before federal taxes will amount to ten times the largest annual interest requirements. Net earnings for 1918 after federal taxes amounted to over five times and estimated net earnings for 1919 are nearly seven times the largest annual interest requirements.

Hurley Machine Plans Capital Increase.

The Hurley Machine Co. of Chicago proposes to increase its common capital stock from the present 15,000 shares of $100 par value to 200,000 shares of no par value, the new capital thus derived to be used in enlarging its plant at West 22nd street and South 54th avenue. It also is proposed to increase the number of directors from five to nine.

Notice of the plan has been given in a call for a special meeting of stockholders on Oct. 2. It is stated that of the new common stock, 100,000 shares will be presently issued, part in exchange for the old common stock and the rest at a price presumably below the current market. The old common stock was quoted recently at $190 bid, with none offered. The subscription rights to the new stock will go to stockholders and a public offering is not contemplated.

The Hurley company at present has outstanding $1,119,900 common stock and $500,000 7% cumulative preferred stock, which was publicly offered in January, 1918, at $100 for each share and 15% of common stock. The preferred stock eventually will be retired through a cumulative sinking fund of 3% of the outstanding issue for each year beginning next January; and also 15% of the net earnings applicable to the common stock beginning Jan. 1, 1918. The company has bought in $14,330 of the preferred. The company has $200,000 bonds outstanding.

The present common stock is on an 8% dividend basis. The company's report as of Dec. 21, 1918, shows current assets of $1,380,654, current liabilities of $519,323, and surplus of $746,938. The value of plant, etc., is placed at $669,472.

The business of the company, which manufactures the "Thor" products, including electric washing machines, ironing machines and vacuum cleaners, is running at a record breaking rate. Proceeds of the stock will be used to erect additional plants.

Eastern Dakota Electric Bond Issue.

The Chicago Trust Co. is offering in denominations of $1000, $500 and $100, $450,000 first mortgage 6% gold bonds of the Eastern Dakota Electric Co. at 97 and interest. These bonds are dated Nov. 1, 1917, become due Nov. 1, 1927, and yield about 6½%. They are a direct first mortgage against all property owned by the company. The company owns and operates under favorable franchises the electric light and power business in Watertown and Yankton, S. D., two of the oldest and most prosperous cities in that state.

Byllesby Bond Department Opens Evansville Office.

The bond department of H. M. Byllesby & Co. announces the opening of an office in Evansville, Ind., in charge of F. W. Lauenstein, who has been connected with banking interests in that city for more than fifteen years. The office is located in the Citizens Bank building. This is one of a number of branch offices which will be opened by the bond department as part of its expansion program and for the purpose of better serving its clientele.

Utah Power & Light Co. has declared the regular quarterly dividend of 1¾% on preferred stock, payable Oct. 1, 1919, to stockholders of record Sept. 16.

Michigan State Telephone Co. has declared a quarterly dividend of $1.50 on preferred stock, payable Sept. 30 to stock of record Sept. 22.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Sep. 16.	Bid Sep. 23.
Adirondack Electric Power of Glens Falls, common	6	14	14
Adirondack Electric Power of Glens Falls, preferred	6	77	77
American Gas & Electric of New York, common	10+extra	120	118
American Gas & Electric of New York, preferred	6	40	40
American Light & Traction of New York, common	..	230	225
American Light & Traction of New York, preferred	6	94	94
American Power & Light of New York, common	4	..	..
American Power & Light of New York, preferred	6	..	..
American Public Utilities of Grand Rapids, common	..	5	5
American Public Utilities of Grand Rapids, preferred	7	24	20
American Telephone & Telegraph of New York	..	101⅜	101½
American Water Works & Elec. of New York, common	..	5	5
American Water Works & Elec. of New York, particip	7	10	10
American Water Works & Elec. of New York, first preferred	..	57	57
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	22	22
Cities Service of New York, common	+extra	483	487
Cities Service of New York, preferred	6	77¾	77
Commonwealth Edison of Chicago	8	110	107¼
Comm. Power, Railway & Light of Jackson, common	..	22	23
Comm. Power, Railway & Light of Jackson, preferred	6	45	50
Federal Light & Traction of New York, common	..	9	9
Federal Light & Traction of New York, preferred	..	47	47
Illinois Northern Utilities of Dixon	6	78	75
Middle West Utilities of Chicago, common	2+extra	30	30
Middle West Utilities of Chicago, preferred	6	50	50
Northern States Power of Chicago, common	..	65½	65
Northern States Power of Chicago, preferred	ex.div.7	90	90
Pacific Gas & Electric of San Francisco, common	..	67½	67½
Pacific Gas & Electric of San Francisco, preferred	6	88	88
Public Service of Northern Illinois, Chicago, common	7	83	85
Public Service of Northern Illinois, Chicago, preferred	6	90	87
Republic Railway & Light of Youngstown, common	4	10	12
Republic Railway & Light of Youngstown, preferred	6	45	48
Standard Gas & Elecric of Chicago, common	..	34	32½
Standard Gas & Electric of Chicago, preferred	8	41½	41
Tennessee Railway, Light & Power of Chattanooga, common	..	4	5
Tennessee Railway, Light & Power of Chattanooga, preferred	6	13	13
United Light & Railways of Grand Rapids, common	4	42	41
United Light & Railways of Grand Rapids, preferred	6	70	70
Western Power of San Francisco, common	..	24	24
Western Union Telegraph of New York	extra	85⅛	85½
Industries.			
Electric Storage of Philadelphia, common	4	97	97
General Electric of Schenectady	8	168½	164
Westinghouse Electric & Mfg. of Pittsburgh, common	7	54¾	54⅛